TEACHER'S MANUAL

MASTERY IN MATHEMATICS THROUGH THE CONCRETE PICTORIAL ABSTRACT (CPA) APPROACH

3
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Our Core Philosophy

This Teacher’s Manual has been designed to promote good teaching practices for teachers to implement the Single National Curriculum. This series provides teachers with the flexibility to choose the elements that are right for their learners.

Teachers must create a conducive environment for learning Mathematics in the class that rewards creativity and enjoyment. When introducing a concept, teachers need to ensure that pupils can relate mathematical activities and problems to relevant and real-life situations. Teaching mathematical concepts with real-life context and providing hands on experience facilitates the teaching process, so long as the context is comprehensible to the class. Pupils should be able to apply what they learn in class to real-life situations to find solutions. This series engages pupils by providing hands-on and interactive activities, as well as individual exercises. Each unit is book ended by class discussions, inviting pupils to share their perspective, and all concepts are supported by real-life tie ins. This approach begins every unit by inviting each pupil individually to have an opinion, and at each unit’s end, they can discuss how their opinions have changed, and whether they see the importance of what they learned. The heavy focus on inquiry-based learning, demonstration approach, and cooperative learning allows the teacher to expose the class to different teaching styles, which will ultimately help pupils to better understand their own needs as learners. The teachers’ manual provides instructions on the use of resources to help them carry out the above mentioned objectives. If a concept is taught in a comprehensive manner with clear instructions supplemented with hands-on activities and practice, most pupils would be able to achieve the set assessment target. Each pupil has a set pattern and pace of grasping concepts, but the expectation is the plateau of mathematical competency for all. In this regard, the manual serves as a support to teachers regardless of what series they use.

The Teacher’s Manual supports a meaningful and holistic approach to teaching the strands of Mathematics. The buildup of concepts throughout this series is progressive and comprehensive. With the implementation of hands-on activities, the learning of a mathematical concept is complemented with experiences that make learning Mathematics enjoyable and give pupils the ownership of independent and group practices. Multiple strategies are implemented through activities in the form of games, standard and non-standard materials and resources. The Teacher’s Manual facilitates teachers to implement this aspect of the series proficiently. The Teacher’s Manual provides a structure whereby teachers and coordinators can select, combine and improvise various pedagogical practices for the pupil-centric textbook and workbooks. In this regard, the Teacher’s Manual provides the following elements:

- **SNC Aligned** – SLOs listed at the start of each unit, as well as next to each activity in the margins.
- **Unit Guides** – Detailed lesson plans for the lessons to keep the teaching approach organised and accessible for the teachers. It encompasses prior learning, pre-emptive pitfalls, introduction, and problem solving.
- **Inclusivity in the Class** – An essay detailing some of the most prevalent disabilities in schools. How to see the signs, and how to make sure your class is a good learning environment for all your pupils.
- **Tackling Math Anxiety and Avoidance** – Math should be taught in a fun and inviting way, and to do it right, one must understand what not to do. This write up discusses all the contributors of Mathphobia, as well as how to see the signs of it in pupils.
- **Let’s Begin** – An introductory paragraph to start a class discussion, preparing the class to break into a new unit.
- **Activities** – Structured activities designed to make sure that pupils learn everything they need to know in an interactive and hands on way.
- **Let’s Try It** – Class exercises for pupils’ individual or pair work so they can practice concepts as they learn them.
• **Let’s Talk Math** – Mathematical communication support. Real-life tie ins are necessary for pupils to really appreciate the math that they are learning. This will help you start a conversation at each unit’s end, bringing the topic to conclusion, as well as leading pupils to reflect on what they learnt.

• **Let’s Get Practical** – An end of unit activity that incorporates a real-life tie in, including as many SLOs as possible.

• **Confusion Bar** – A bar that ranks confusion levels from 1 to 5, both reminding the teacher to check in, as well as allowing them to track the number of pupils whose understanding is not up to par.

• **Math Lab** – Alongside our activities we list page numbers from Math Lab; an activity handbook that might help struggling pupils, and also help all pupils practice their concepts.

• **Self Assessment** – Given at the end of each unit, a page for the teacher to assess how well the class has understood the lesson, in accordance with the SNC’s “Role of a Teacher”.

A user-friendly guide to the SNC to help teachers perform to the best of their abilities, and to remind pupils that there is a place for creativity in Math. It is crucial that children build a good relationship with the subject at early stages, given that there is so much of it in day to day life, and also, a solid foundation would be very helpful for later years.
Tackling Math Anxiety and Avoidance

The fact that it is common for students to struggle with math is often written off as nothing more than a difficult subject being neglected by unmotivated students. Surely, if children put in the necessary practice time, they would succeed at whatever they tried. Or perhaps some children just aren’t able to comprehend ideas so complex because they’re not smart enough.

Researchers believe that about 20% of people suffer from “math anxiety” and some psychologists believe it to be a diagnosable condition. Math anxiety will most likely lead to “math avoidance”. Students will often appear unfocused and like they are looking for reasons to leave the class. It might look like they would prefer anything to actually trying to learn the material. It will seem like they are lazy or naughty, but the fact is, these children are likely just looking for an escape from a stressful situation. They don’t ask for help or guidance because they don’t believe that they have any chance of doing better, and because they feel unable to confront their fears. The stress that they feel during class also impacts their ability to learn. Children are already so susceptible to distractions that a high stress situation can almost entirely block their working memory. Furthermore, these feelings are not simple enough for young children to be able to explain to adults, even if they are offered help. What they understand is that they are low achievers, they are bad at math, and they will always be bad at math.

When trying to understand how to fix or avoid this in the class, here are some things you should keep in mind:

**Math Anxiety is Contagious**

As a teacher, if you start seeing math avoidance ask yourself what might have triggered it. Is the overall class attitude toward math negative? How did it become that way? It is not uncommon for the idea to be picked up from the teacher. That’s why it is important to never present the subject as something that students should worry about. Don’t tell your students that the next unit is hard. Instead, give them the lesson, and let them ask questions so they know that it’s not a big deal to need help.

**Do Not Promote the Idea That Some People are Just Not Good at Math**

Also, be sure to reassure your students that everyone is different, but everyone can do math. Remind them that it is not their fault if something did not make sense the first time because all people have different ways of learning. Or better yet, tackle new topics by catering to multiple learning styles. Incorporate some activities and some creativity so that at the end of the introduction, they will all have a clearer idea of the concept.

**Avoid Shame in the Class**

One of the bigger roots of stress in the class is the fear of failure. Instead of calling out children by name and asking them to answer a question in front of the class, ask the question and allow them to raise their hands. If you notice some children that tend not to volunteer, check their written work to see how they’re performing. If they’re doing well, then they’re simply not comfortable speaking up in front of their classmates and maybe just need a confidence boost. If they’re not performing well, then you are likely dealing with avoidance.

**Group Weaker Students with Students that Could Help Them**

When doing group exercises in the class make sure the students who are struggling are evenly distributed. Often, they will feel more comfortable approaching their peers for help, or might even learn from watching them, because they won’t be feeling as though they are the ones faced with the problem. Furthermore, children have a better idea of what was challenging about a subject than an adult. They may be able to clear up some confusion for their friends that the teacher was not aware of.

**Students Who Experience Math Anxiety Can Actually Be Good at Math**

Do not think of these children as underachievers. Instead, think of them as students who have something crucial missing from their learning process. Instead of repeating the same explanation, try to use different language, or better yet, design an experience that will show them what you’re trying to explain. Keep in mind that anxieties are impacting students’ comprehension skills, so your approach must be something that helps students feel like their is less pressure to succeed.
Inclusivity in the Class

Every student is differently abled, and as teachers, we try multiple approaches to cater to each one of them. However, some students need special consideration. Below are some examples of students who could be held back in the class due to their special needs, and small considerations that could be made that might make all the difference without compromising on learning objectives. Be sure to be aware of exactly how severe the impact is before deciding what changes to make. The goal here is to create an environment where the children can adapt to life amongst abled people, and learn to be as independent as possible, which is why one should try to avoid extra attention. Children should never believe that they are not able to do things, and instead be given the tools to find ways to do things.

Sight

While it is commonly believed that visually impaired, or blind students need constant help, teachers should keep expectations high, while still making it clear that it is always alright to ask for help, as is for regular students. Any changes or adaptations should apply to the entire class, to avoid singling anyone out.

Some good practices to incorporate are being more verbal, especially when writing on the board, and always calling children by their names rather than pointing. When the illustrations in the book are pertinent to the lesson, describe them aloud to the entire class so that no one misses out. If possible, use tangible objects as counters, so that the class is not entirely reliant on images. If you do see these students struggling, instead of rushing in to help, offer information to the entire class, for example, if the child is having trouble finding a book, describe the shape instead of getting it for him or her.

Hard of Hearing

Depending on when these children lost their hearing, they may be lacking in vocabulary, and have trouble speaking.

Seat these students near to the front of the class since they will be almost entirely reliant on the blackboard, and they may be able to lipread if they have clear sight of the teacher. Therefore, the teacher should always face the class when speaking, and also, keep in mind that hearing-impaired students cannot listen and take notes simultaneously, especially if watching an interpreter. If possible, make sure important information is also available as handouts, including class announcements about deadlines and scheduling. Furthermore, any videos or documentaries screened at school should have subtitles.

Speech

These students will need some facilitation when encountering new vocabulary. It might be helpful if before starting a new unit, there is five-minute class discussion about the unfamiliar terminology that might pop up so that they can make note of it. Always ask students if they need help before assuming that they do. If they can successfully complete a task that involves communication, praise them, but do not draw too much attention as if it was unexpected. It might seem necessary to eliminate verbal assessments for these students but be cautious about this. There should always be an opportunity for the student to attempt to improve, or practice their communication abilities, and they should feel comfortable doing so. Small improvements should be acknowledged, and the goal should remain to meet the learning objectives however possible.

Memory

To help these students, one must understand the difference between working short-term and long-term memory. When a student learns new information, it is initially stored in working memory, as he or she uses it, and with time, as it stops being pertinent to their actions, it shifts to long term memory. If the child can recall concepts that were taught within the last 24 hours, but struggling to remember information from two weeks ago, then the issue lies with their long-term memory. If it is the other way around, like if they are forgetting instructions they were just given, then it is their working memory that is the problem.
While it has a bad reputation, rote learning can be very helpful for these students. Even employing repetition to really drill things into their minds might be helpful. The more modern approaches like project-based learning will certainly help them grasp concepts, but those concepts need to stick in their minds, so constantly relating new material to what was learned previously, and revising will help achieve this. Also, encourage active reading when assigning homework. Ask students to make notes while doing reading so that they can engage more with the text and have a personalized reference point when they need to revise. Lastly, create associations. Make games out of math activities, sing songs, use acronyms, and relate math to real-life. These students will likely have to work slightly harder on their own time, but these small changes to the class will both encourage and facilitate this.

**Dyslexia, Dyscalculia, and Dysgraphia**

While these learning disabilities are estimated to affect 5 to 20% of people globally, they often go undiagnosed. Since students are not aware that the way they perceive things is different, as a teacher, one must be aware of the signs.

a) **Dyslexia**

Causes problems with reading, writing, and spelling. Some signs to look out for are delayed speech development, trouble pronouncing words, for example, saying “taplop” instead of laptop, trouble with sentence construction, even verbally, and lack of appreciation for rhymes. These children will often seem disinterested in learning the alphabet as they won’t comprehend it as well as their peers.

b) **Dyscalculia**

A range of difficulties with maths. Students may not immediately understand the meaning of numbers and applying mathematical principals. To identify students suffering from it, look out for children who lose track when counting, and rely heavily on visual aides, like fingers when counting. Placing objects in order, and connected numerals (7) with written out words, like seven will be a struggle for these children.

c) **Dysgraphia**

Affects the act of writing that requires a set of motor and information processing skills. The signs include problems with spelling, handwriting, and expressing thoughts on paper, because students will not be able to think and write at the same time. Their writing will show an inconsistency in spacing, and missing words and letters. An unusual hand position while writing or keeping the paper at an angle is also a symptom.

All these learners will be different. Some may be able to get by in a normal class environment, while some will need special allowances. For instance, allowing the student to bring in an audio recording device would be very helpful. Furthermore, providing a multisensory learning experience will make it less likely that they will miss certain things entirely. It is imperative that these allowances are only made where necessary, and that, as often as possible, they apply to the entire class, as opposed to just one or two students.

**Autism**

When dealing with Autism, one must keep in mind that it is a spectrum, and that it will be different in every student. Some children are diagnosed early on as their Autism affects their every day lives, but some are not diagnosed until quite late in life, as the symptoms vary both in nature and in visibility.

Students who make little or no eye contact, are not able to interact with others, repetitive movements (like flapping arms, or tapping), have low spatial awareness, and are extra sensitive to bright lights and sounds might be on the spectrum. While only a professional can make a diagnosis, proper medical help is not always accessible, and parents do not always notice the signs. Autistic children are often also prone to tantrums, and can come across as insensitive, and or, unemotional.

While this is a complicated disorder, small efforts can go a long way in helping these students thrive. Highly structured environments, following a routine, and giving plenty of warning before big changes will make these students feel more comfortable, and able to focus on subject matter. Limit class distractions and give written
instruction instead of long verbal announcements. These children express themselves differently, but often are very intelligent and passionate. Approaching their learning with a positive attitude will do wonders for them.

**ADHD (Attention Deficit/Hyperactivity Disorder)**

ADHD is a disorder that leads to problems paying attention, impulse control, and hyperactivity. While all children are easily distracted, it will be especially apparent in these children. Like Autism, a diagnosis can only be made by a professional, but since not all children will have that privilege, teachers can facilitate their learning by making the class environment as stable and predictable as possible.

The instructions given in class should always be clear, and if possible, consistent. All students should understand what is expected of them, and this should be repeated as often as seems necessary. Furthermore, instead of just verbally communicating them, also put them up in the room so that students can refer to them whenever they need to. A good tool is to have the children tell you what they understood was or is expected of them, as children often listen without absorbing, and children with this particular disorder may be skilled at appearing engaged, whereas their mind is actually elsewhere.
Single National Curriculum 2020

The curriculum for Mathematics is comprised of the following four strands. The strands are intentionally kept broad to allow flexibility to the teachers to adapt their teaching styles in accordance with their students.

These strands include Numbers and Operations, Algebra, Geometry and Measurement and Data Handling. All of this content is underpinned by reasoning and logical thinking. All standards, benchmarks and students’ learning outcomes are built around these strands.

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<th>Key Learning Strands</th>
<th>Standards</th>
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<td>1. Numbers and Operations</td>
<td>• identify numbers, ways of representing numbers, comparing numbers and effects of number operations</td>
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<td></td>
<td>• compute fluently with fractions, decimals and percentages</td>
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<td></td>
<td>• examine real-life situations by identifying mathematically valid arguments and drawing conclusion to enhance their mathematical thinking</td>
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<tr>
<td>2. Algebra</td>
<td>• analyse number patterns</td>
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<td></td>
<td>• known facts, properties and relationships to analyse mathematical situations</td>
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<tr>
<td></td>
<td>• examine real-life situations by identifying mathematically valid arguments and drawing conclusion to enhance their mathematical thinking</td>
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<tr>
<td>3. Geometry and Measurement</td>
<td>• identify measurable attributes of objects, construct angles and two-dimensional figures</td>
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<td></td>
<td>• analyse characteristics and properties of geometric shapes and develop arguments about their geometric relationships</td>
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<tr>
<td></td>
<td>• examine real-life situations by identifying, mathematically valid arguments and drawing conclusion to enhance their mathematical thinking</td>
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<tr>
<td>4. Data Handling</td>
<td>• collect, organise, analyse, display and interpret data/ information</td>
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<tr>
<td></td>
<td>• examine real-life situations by identifying mathematically valid arguments and drawing conclusion to enhance their mathematical thinking</td>
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The Mathematics Curriculum Standards and Benchmarks – SNC 2020

The Standards for Mathematics are further sub-divided into the following Benchmarks for Grade I – V.

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<th>Standards</th>
<th>Benchmarks Grade I – III</th>
<th>Benchmarks Grade IV – V</th>
</tr>
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<tr>
<td>Numbers and Operations</td>
<td>The students will be able to:</td>
<td>The students will be able to:</td>
</tr>
<tr>
<td></td>
<td>• identify, read and write whole numbers up to 10,000</td>
<td>• read and write whole numbers up to 1,000,000 (1 million) in numerals and words</td>
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<tr>
<td></td>
<td>• read and write Roman numbers up to 20</td>
<td>• add and subtract numbers of different complexity and of arbitrary size</td>
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<td></td>
<td>• identify and differentiate even and odd numbers up to 99</td>
<td>• multiply and divide numbers, up to 6 digits, by 2 or 3-digit numbers and by 10,100 and 1000</td>
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<td></td>
<td>• arrange, compare numbers up to 3 digits using symbols (&lt;, &gt; or, =)</td>
<td>• solve real-life situations involving operations of addition, subtraction, multiplication, and division</td>
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<tr>
<td></td>
<td>• identify and recognise place values up to 5-digit numbers</td>
<td>• recognise and differentiate between factors and multiples of two or three 2-digit numbers</td>
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<td>• represent and identify the given number on number line</td>
<td>• find highest common factor (HCF) and least common multiple (LCM) of two, three, or four numbers, up to 2-digits</td>
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<td>• round off a number to the nearest 10 and 100</td>
<td>• solve real-life situations involving HCF and LCM</td>
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<td>• add, subtract numbers up to 4 digits</td>
<td>• recognise and compare like and unlike fractions</td>
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<td></td>
<td>• develop multiplication tables up to 10</td>
<td>• arrange, convert and simplify fractions</td>
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<td></td>
<td>• multiply number up to 2 digits with 1-digit numbers</td>
<td>• add, subtract, multiply and divide fractions</td>
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<td></td>
<td>• recognise and use of division symbol, divide up to 2-digit numbers by 1-digit number</td>
<td>• solve real-life situations involving addition, subtraction, multiplication and division</td>
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<tr>
<td></td>
<td>• solve real-life situations involving addition, subtraction, multiplication and division</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• recognise fractions and different forms of fractions with the help of objects and figures</td>
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<tr>
<td>Standards</td>
<td>Benchmarks Grade I – III</td>
<td>Benchmarks Grade IV – V</td>
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<tr>
<td></td>
<td>• express and match fractions in figures and compare fractions with same denominators using symbols &lt;, &gt; or, =</td>
<td>• apply unitary method for solving real-life situations</td>
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<td></td>
<td>• identify and write equivalent fractions for a given fraction</td>
<td>• identify and recognise decimal numbers</td>
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<td>• add and subtract two fractions with same denominators</td>
<td>• convert decimal numbers into fractions and vice versa</td>
</tr>
<tr>
<td>Algebra</td>
<td></td>
<td>• add and subtract numbers up to 3 decimal places</td>
</tr>
<tr>
<td></td>
<td>• analyse number patterns</td>
<td>• multiply and divide decimal numbers with whole numbers</td>
</tr>
<tr>
<td></td>
<td>• known facts, properties and relationships to analyse mathematical situations</td>
<td>• round off decimal numbers up to specified number of decimal places</td>
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<tr>
<td></td>
<td>• examine real-life situations by identifying mathematically valid arguments and drawing conclusion to enhance mathematical thinking</td>
<td>• solve real-life situations involving decimal numbers (up to 3 decimal places)</td>
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<td></td>
<td>• develop the concept of equality using addition and subtraction of numbers</td>
<td>• convert percentage to fraction and to decimal and vice versa</td>
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<td></td>
<td>• identify and complete geometrical patterns on square grid according to attributes like shape, size and orientation</td>
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<td></td>
<td>• develop the concept of equality using addition, subtraction, multiplication, and division of numbers</td>
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<tr>
<td></td>
<td>• identify and describe repeating pattern using relationship between consecutive terms and generate number patterns</td>
<td></td>
</tr>
<tr>
<td>Standards</td>
<td>Benchmarks Grade I – III</td>
<td>Benchmarks Grade IV – V</td>
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</table>
| **Geometry and Measurement** | • use language to compare heights/lengths, masses and capacity of different objects  
• read, recognise and use units of length (kilometre, metre and centimetre), mass (kilogram and gram) and capacity (litre and millilitre) and time (minute and second)  
• add and subtract in units of length, mass, capacity and time for solving real-life situations  
• use solar and Islamic calendar to find a particular date/day  
• recognise and identify two- and three-dimensional figures  
• determine perimeter of square, rectangle, and triangle  
• identify and differentiate straight line and curved line  
• identify and draw points, lines, line segments, and rays  
• identify and describe symmetrical shapes | • convert standard units of length, mass, capacity, and time  
• solve the real-life situations involving addition and subtraction of units of distance/length, mass, capacity, and time  
• distinguish parallel and non-parallel lines  
• identify, classify and construct different types of angles  
• describe and classify 2-D figures and 3-D geometrical objects  
• determine perimeter and area of square and rectangle  
• describe and complete symmetrical figures with respect to given line of symmetry and point of rotation |
| • identify measurable attributes of objects, construct angles and two-dimensional figures  
• analyse characteristics and properties of geometric shapes and develop arguments about their geometric relationships  
• examine real-life situations by identifying, mathematically valid arguments and drawing conclusion to enhance mathematical thinking |  
| **Data Handling** | • read, interpret and represent data using Carroll diagrams, picture graphs and tally charts | • read and interpret bar graphs, line graphs and pie charts  
• represent real-life situations using pie chart  
• find an average of given quantities in the data  
• draw and read simple bar graphs both in horizontal and vertical form  
• solve real-life situations using simple bar graphs |
| • collect, organize, analyse, display and interpret data/information  
• examine real-life situations by identifying mathematically valid arguments and drawing conclusion to enhance mathematical thinking |  

**Note:** Lifted from SNC document. To learn more about the SNC go to mofept.gov.pk, choose curriculum, then SNC, the Single National Curriculum. Click on maths 2020 to open the document.
Unit 1
Whole Numbers

1.1. Roman Numbers
i. Read Roman numbers up to 20.
ii. Write Roman numbers up to 20.

1.2. Even and Odd Numbers
i. Recognize even and odd numbers up to 99 within a given sequence.
ii. Differentiate between even and odd numbers within a given sequence.

1.3. Place Values
i. Identify the place values of numbers up to 5 digits.

1.4. Numbers up to 100,000
i. Read and write given numbers up to 10,000 (ten thousand) in numerals and words.

1.5. Number Line
i. Represent a given number on number line up to 2-digit numbers.
ii. Identify the value of a number from number line up to 2-digit numbers.

1.6. Comparing and Ordering Numbers
i. Compare two numbers up to 3-digits using symbols “<”, “>”, or “=”.
ii. Write the given set of numbers in ascending and descending order (numbers up to 3 digits).

1.7. Estimation
i. Round off a whole number to the nearest 10 and 100.

Plan Ahead:
Roman Numbers 5 lessons
Even and odd numbers 5 lessons
Place Values 5 lessons
Numbers up to 100,000 5 lessons
Number Line 5 lessons
Comparing and ordering numbers 5 lessons
Estimation 6 lessons

The approximate duration of this unit should be 36 lessons.

Before You Start:
Pupils have already learnt to identify the place value of numbers up to 3 digits. Now, they will learn to read and write numbers up to 5 digits in numerals and words. They will also be able to write numbers in ascending and descending order, represent and identify a given value of number on a number line. They may have seen the Roman numbers on clocks and watches. Pupils are new to comparing two numbers using symbols, but they are familiar with the idea of greater and lesser, so it shouldn’t be too difficult for them.
Watch Out For:
Pupils generally get confused between the symbols of greater than and lesser than, while comparing numbers. They might also struggle to remember which Roman numeral is which. The introduction to new numbers may also seem intimidating, but they should feel more comfortable when they realise that it is simply an extension of something they already know.

This Pairs with:
Math Lab 3, pages 2 to 14

Make Sure You Have:
- Roman numeral cards
- Two differently coloured highlighters
- Chart papers
- Bowl
- Markers
- Chits
- Tape
- Three-digit number cards

If they’re Struggling:
Roman numerals will be harder for the pupils to retain as they won’t necessarily be seeing or using them in their daily lives. The only solution is to give them plenty of practice so that they get the hang of it, and to take pauses throughout the unit. The concept of rounding off seems pointless, use the example of time. People always round off when stating how long they need to do things. Explain that this is because when you are guessing, you might be quite sure about the fact that you need 17 minutes to do something, but because you are not absolutely sure, you will say twenty minutes, more likely. When you see the confusion bar, take note of how many pupils fall under each level. If pupils are at a level 3 or below, have them solve the equivalent Math Lab pages in pairs, having weaker students work with more confident students. First do allow the class to collectively ask questions. If all pupils are at a 4 or above, move on to the next activity.

Let’s Begin
Ask pupils why numbers are important. They will have many real-life examples of how and why they use numbers and see numbers being used in their lives. Ask them if they think that numbers are complicated. They have learnt a lot about numbers, and should realise that even though there is more to learn, that doesn't mean it has to be complicated. Point out though that everything they have learnt about numbers has been helpful for them when they work with them. For example, knowing about place value made it much easier for them to add and subtract big numbers. Ask them to think out loud about how their knowledge of numbers improves the quality of their lives.
Write all the Roman numerals on the board, up to 20. Ask pupils to try to identify them. Some pupils may be familiar, so if anyone has the right answer, allow them to try to explain to the rest of the class. If they don’t know, explain to the class that these are Roman numerals. They go up to 20, just like the numbers that they are used to, and they are said the same way. They are only written differently. Go through them with the class once, reading them aloud, and pointing to each number as you say it. Explain that the I is a 1, the V is a 5, and the X is a 10. The way to read them is simply to add them together. For example, XX is two tens, therefore, it is 20. Go through them a few times, and then make groups of 3 to 5 pupils, and give each group a set of twenty cards with a Roman numeral on each card. Give them some time to arrange them in order.

**Activity 1**

10 minutes

**Roman numeral cards**

Let’s try it

Give pupils time at their desks to write all the numerals in their notebooks, in order. This should be done silently. After, have pupils peer review. Remind them to remember that I is a 1, the V is a 5, and the X is 10.

**Activity 2**

20 minutes

**chart paper markers tape two colours of highlighters**

Ask the class, which numbers can be divided by 2. They should name even numbers at random. Explain that numbers that can be divided by 2 are called even numbers. Ask them then to think of numbers that cannot be divided by 2. Tell them these are called odd numbers. Divide the class into 5 groups. Allot them each few numbers between 1 to 99 and ask each group to make cards for those numbers. Once they are done, tape them up on the walls around the class, in order, so that there is a sort of number line all around the class. Give highlighters and ask pupils and ask them to colour even number cards one colour, and odd number cards a different colour. Make sure they all know the colour code that you have decided, and also remind them not to highlight unless they are sure. Once they are done, ask them to take their seats, and ask them if they can think of any tricks to identify whether or not a number is divisible by 2. Especially since bigger numbers are harder to divide. After the discussion, point out to them that if the last digit of a number is 0, 2, 4, 6 or 8 then the number, for sure, is even.

**Let’s try it**

Write up to 20 random number sequences on the board. Ask pupils to copy these down, and highlight the even numbers. After, ask them to peer review.
Write 5 zeros on the board, and ask pupils how many there are. Point to the rightmost 0 and ask them what its place value is. They should say ones. Write ones on top of the 0. Then do the same for the rest of the zeros. The place values, from right to left should be ones, tens, hundreds, thousands, and lastly, ten thousands. Go over this a few times, then erase the place values, and ask pupils to raise their hands to name them. Once they all get the hang of it, write random five-digit numbers on the board and ask pupils to come to the board one by one to circle a particular place value.

Read out twenty five-digit numbers, and after each number, say a place value up to ten thousands. Ask pupils to write them down in digits and circle the stated place value. Ask them to peer review at the end.

Divide the class into groups of up to 5 pupils each. Before you start, explain the activity. Each group will need to elect one member to write on the board. Two of the groups will be randomly selected to go first. They will both come to the front of the class, and you will read out a number up to ten thousand. Then each group will discuss with their group members to decide whether they can spell out the number. The first group to raise their hand will get to go first, but after they have raised their hand, the writer can no longer discuss with the rest of the group. The first group to get two words wrong, will be disqualified, and another group will replace them. Keep playing until all but one have made a mistake, so that they can be winners. If the activity is taking longer than 20 minutes because no one is making a mistake, then interrupt to declare a tie, and replace the two groups with a different two. Before starting, write the number ten thousand three hundred and four (10304) on the board, in words, just so that they know that while five-digit numbers may be long, they are comprised of words that they should know how to spell. Erase the board before starting.

Ask the class to revise their spellings of numbers up to ten thousand as homework so that you can have a spelling test.

<table>
<thead>
<tr>
<th>Refer to If they’re struggling</th>
<th>Confusion level</th>
<th>1 - Does not understand any concept</th>
<th>2 - Does not understand most of the concepts</th>
<th>3 - Understands some concepts but has questions</th>
<th>4 - Understands all the concepts, just needs more practice</th>
<th>5 - Feels confident solving questions</th>
<th>If pupil is below 3 use Math Lab</th>
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<td>Number of Pupils</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Activity 5

10 minutes
bowl chits

This pairs with Math Lab pages 7 and 8

Fill a bowl with chits and pass it around the class. Each chit should identify two 2-digit numbers that have a difference of 10. For example, 35 and 45, or 76 and 86. Once everyone has picked their chits, pick one out yourself. Draw a line on the board, and make a number line, ranging from the smaller number on the chit to the larger one. Do it step by step so that the class can see how it is to be done. Then ask them to get into pairs and help each other make a 10-centimetre line and make a number line from the smaller number on their chits to the bigger one.

Let’s try it

This exercise should be done individually. Ask each pupil to choose three two-digit numbers. Then ask them to make three number lines, one for each, that start from five numbers before, and extend to five numbers after. However, when they write the numbers along the lines, they should leave the space for any three numbers blank. So if the chosen number was 45, the digits on the number line would read 40, 41__, 42__, 43__, 44__, 45, 46, 47, 48, 49, 50. Give them about 5 minutes to do this, and then collect their notebooks, and redistribute them at random. Ask the class to open to the page with the number lines and fill in the three blanks by looking at the surrounding numbers. Before collecting the books, ask pupils to be sure that they haven’t written the chosen numbers down. The number that comes just before a number is called the predecessor of that number (‘pre’ means before.) The number that comes just after a number is called the successor of that number (‘succeed’ means follow.)

Assign twenty minutes of classwork from the textbook here before moving forward.

Activity 6

5 minutes

Draw a number line. Taking different numbers on the number line, tell the students that a number closer to zero is smaller than a number further from zero. Give the pupils a few examples on the number line, like 7 and 11. 7 is closer to zero as compared to 11 which is further from zero. Hence, 11 is greater than 7 or 7 is smaller than 11. Give similar examples to enhance students’ understanding. A number strip can also be used in place of a number line. At this stage you can introduce the symbols of greater than (>) and less than (<) by using a common yet interesting activity of a hungry crocodile. The open mouth of hungry crocodile is always towards the greater number. Therefore, 7 < 11 or 11 > 7. Present more pairs of numbers on the board, slowly moving up to three digits.
Activity 7
13 minutes
three-digit number cards

Make groups of three and explain the activity. You will hand each group 5 three-digit number cards and ask them to arrange them in ascending order. They will need to do this as quickly as they can, because you will wait 30 seconds and hand them two more numbers that they will have to add to their arrangement, making sure that it remains ascending. This will happen five times, so the activity, once they get their numbers, should take no more than two and a half minutes. After time is up, they will have to stop touching their cards, so that you can check if they have done it right. If any of the groups have made mistakes ask them to take a second look, so you can know if they need help with the concept, or if they just ran out of time. Once all the arrangements have been checked, and if necessary, corrected, collect all the cards, shuffle the groups, and repeat it once more, but this time, making sure to ask them to arrange the cards in descending order instead.

Assign classwork from the textbook.

Activity 8
10 minutes

This pairs with Math Lab page 9

Explain to the class, that although in many situations it is good to be very specific when using numbers, especially with measurements, but sometimes, we have to be intentionally non-specific. Write the number 9 on the board and use the example of time. If you need 9 minutes to do something, are you going to say 9 minutes, or 10? While some pupils may prefer to say 9, most people don’t. Therefore, when using a number that we are not entirely sure about we round up. Any number can be rounded up, and they are not always rounded up to ten. In fact, they can be rounded up to tens and hundreds, and thousands. For this activity they will be rounding up to the nearest tens and hundreds. When you are asking to round up to ten, that means that you make it so that the number ends with one zero. If you are rounding up to the nearest hundred, then you make it so the number ends in two zeros. To explain how to do this, ask pupils to pick any number, with any number of digits, but it should be a number with no zeros. Once you have a number, say that you will be rounding it up to the nearest ten. Then draw it on a number line. So for example, if the number is 839, draw a number line showing 820, 830, 840, and 850. Then mark 839 on it. Explain to pupils, when you say round up to the nearest ten, it literally means nearest ten. Ask pupils then, what is the nearest ten. When asked, they should be able to tell that the nearest ten to 839 is 840. Explain that the midpoint between tens is five, so if the number had been 834, it would have rounded down to 830. Ask them at this point if they have questions. If no one asks, explain that if the number is at the midpoint, meaning that it ends in five, then it goes up. Repeat this, but now round the same number up to the nearest hundred, using a number line again. Do it on the board, and explain that the midpoint for rounding to 100 is 50, so if a number ends in 50, or 51, then it goes up, but if it is 49, it will go down.
Let’s try it

Present pupils with the following numbers:

1392  20035  749  3055  754  82950  82925  3333  355  450
25150  83923  2032  238  802  733  272  819  285

Ask them to round each of them up to the nearest ten and the nearest hundred. They need not draw forty number lines if they don’t feel the need, and are able to do it mentally, but they should draw at least five.

Let’s talk Math

Numbers are seen everywhere in our daily-life. We find numbers on price tags, phonebooks, and house addresses. Numbers are also found as page numbers in a book, age measuring length, weight, capacity, and many more. Ask pupils if the answers they gave during the Let’s Begin discussion have changed. Do they think that any of what they learnt during this unit could improve their lives? Ask them to discuss thoughts and wait for Roman numerals to come up. Ask pupils how they feel about learning different kind of numbers. Do any of them use Roman numerals in their day to day lives? Give them five minutes at the end of the discussion so that they can write a reflective essay.

Let’s get practical

Make teams of three. The way that this activity will work is that a team will come to the front of the class, and two of the team members will get one sheet each. The sheet will have ten numbers, which will need to be rounded up (the sheet should mention if it is to the nearest ten or hundred, individually). The pupil who did not get a sheet will stand in the middle of the board, and the other two will stand at his sides. When you say go, the two with the sheets will turn around and they will write down the first number, rounded up. The middle pupil will then have to as quickly as possible, draw a greater or lesser sign in between the two rounded up numbers. They will have to do this fast, because each team will be timed, and whoever does it fastest will win.
Self Assessment

1.8. Roman Numbers
1.9. Even and Odd Numbers
1.10. Place Values
1.11. Numbers up to 100,000
1.12. Number Line
1.13. Comparing and Ordering Numbers
1.14. Estimation

| Refer to Confusion if they’re 1 –Does not level understand 2- Does not 3 - Understands 4 - Understands 5- Feels Number of any concept most of the all the concepts, confident Pupils solving questions If pupil is below 3 use Math Lab |
|-----------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|-------------------------------------------------|
|                 |                                                  |                                                  |                                                  |                                                  |                                                  |                                                  |
| Number of Pupils |                                                  |                                                  |                                                  |                                                  |                                                  |                                                  |

Multiple Choice Questions

Read out the questions or write them on the board. You may ask pupils to either write the correct answer on a white board and hold it up or call out the options one by one, asking them to raise their hands to show which one they have chosen.

1) What numbers are these? (VI, IV, XIII)
   a) 6, 4, 13
   b) 4, 6, 13
   c) 6, 4, 30
   d) 4, 6, 7

2) If a number ends in 0, is it:
   a) Even
   b) Odd
   c) It could be either

3) What is the missing symbol? 6 ___ VI
   a) >
   b) <
   c) =
Unit 2

Number Operations

**2.1. Addition**

i. Add numbers up to 4 digits with and without carrying vertically and horizontally.

ii. Add numbers up to 100 using mental calculation strategies.

iii. Solve real-life number stories up to 4 digits with and without carrying involving addition.

**2.2. Subtraction**

i. Subtract numbers up to 4 digits with and without borrowing.

ii. Subtract numbers up to 100 using mental calculation strategies.

iii. Solve real-life number stories up to 4 digits with and without borrowing involving subtraction.

**2.3. Multiplication**

i. Develop multiplication tables for 6, 7, 8, and 9.

ii. Multiply 2-digit numbers by 1-digit numbers

iii. Multiply a number by 0 and 1.

iv. Apply mental mathematical strategies to multiply 1-digit numbers to 1-digit numbers.

v. Solve real-life situations involving multiplication of 2-digit numbers by 1-digit numbers.

**2.4. Division**

i. Divide 2-digit numbers by a 1-digit number (with zero remainder).

ii. Apply mental mathematical strategies to divide 1-digit numbers by a 1-digit number.

iii. Solve real-life situations involving division of 2-digit number by a 1-digit number.

**Plan Ahead:**

Addition 6 lessons
Subtraction 6 lessons
Multiplication 6 lessons
Division 6 lessons

The approximate duration of this unit should be 24 lessons.

**Before You Start:**

Pupils are familiar with all the concepts introduced in this unit addition with/without carrying and subtraction, with and without borrowing so this should more or less serve as a revision and a refinement of their skills. They are also familiar with multiplication and division to some extent.

**Watch Out For:**

Since pupils are not as used to multiplication and division as they are with addition and subtraction, do not assume that they are comfortable with it. It would be a good idea to brush up on the times tables for 2, 3, 4, 5. Mental math is also something the pupils should know how to do, but since this will be the first time they won’t have the option of using paper, start with very simple sums to build confidence.
This Pairs with:
Math Lab 3, page 15 to 22.

Make Sure You Have:
Bowl Fake receipt
Chits

If they’re Struggling:
Problems with this unit will most probably come from a lack of practice, or a misunderstanding of the concepts. If a pupil is finding something difficult, help them through a series of easier questions, so that the concept becomes clear, and then gradually increase the difficulty. It is also a possibility that pupils will struggle to remember what they have learned previously, so revising base concepts would be helpful. When you see the confusion bar, take note of how many pupils fall under each level. If pupils are at a level 3 or below, have them solve the equivalent Math Lab pages in pairs, having weaker students work with more confident students. First do allow the class to collectively ask questions. If all pupils are at a 4 or above, move on to the next activity.

Let’s Begin
By this time students know several number facts and are comfortable with addition, subtraction, multiplication, and division. Concepts such as multiplication being, a form of repeated addition, and division being a form of repeated subtraction, are used in everyday life. Ask pupils for examples where they use multiplication and division in real-life, or where do they see others use it. At first, they may think that they don’t, so remind them that we make calculations every day without even realizing it.
Write the following on the board:

\[ 3819 + 2930 \]

Point out that since these numbers are quite high, the equation looks difficult to solve, but when written vertically, not so much. Show pupils how to write addition vertically.

\[
\begin{array}{r}
13819 \\
+ \hspace{1cm} 2930 \\
\hline
6749 \\
\end{array}
\]

Explain that the reason that it is much easier to solve is because they are not trying to do it mentally. Mental math is when you solve sums in your head, which makes sense when the sum is simple, but when working with larger numbers it does not make sense to do this and using a pen and paper to show your work is much wiser. Write up to five more equations on the board and allow pupils to volunteer to come to the board to write them vertically. These do not necessarily have to involve carrying. It makes sense to start with easier sums with only two-digits per number so that weaker pupils feel more comfortable with addition. Here are some recommended sums:

\[
\begin{array}{c}
1 + 25 \\
82 + 11 \\
832 + 722 \\
738 + 829 \\
4271 + 2839 \\
\end{array}
\]

Let’s try it

Have pupils attempt real-life number stories up to four-digits, with, and without carrying, making sure to show their working. Here are some examples:

1) Jehanzeb is on a road trip. He stops to make coffee and sees that he still has to drive 628 kilometres. He has already driven 599 km. How many kilometres is his entire road trip?

2) Manal wants to buy a painting. She chooses one at the gallery that costs Rs 6975, but it’s not framed. The gallery owner says he can have it framed and delivered to her house, but it will cost an additional Rs 2500. What will the total cost be if she takes this option?

3) Hashim writes for a magazine that pays him based on how long the article is. In June he wrote one that earned Rs 3085, and one that earned Rs 5950. How much will he get paid for June?

4) Hasnain forgets his wallet at home, so he borrows Rs 4999 from his friend to buy a video game, and 195 for snacks. When he gets home, how much money should he put aside to give to his friend?

5) Asad has a twin sister. For their birthday, they each get to choose a cake. Asad’s cake costs Rs 2499, while his sister’s costs Rs 1650. How much will his mother pay at the bakery?

6) Rida has Rs 3159. Her grandmother gives her Rs 2550. How much money does she have now?

7) Ansar goes out shopping for his wife’s birthday. He buys a cake for Rs 1499, and flowers for Rs 1850. How much did he spend?
8) Aslam has a cupcake company. He has two customers who are both having a party on Saturday. One has ordered 925 cupcakes, and the other has ordered 588. On top of that, Ansar would like to make 13 extra for his staff since they will have worked so hard. How many cupcakes will he need to have ready by Saturday?

9) Laila goes grocery shopping with her parents. Her father takes one cart and fills it up with Rs 2896 worth of groceries, and her mother puts Rs 6097 of things in the other. What will their total be?

10) Tehreem takes her family out to a buffet dinner for her parents’ anniversary. The total cost of what they ordered is Rs 1083, but there is also a set charge for them to attend the buffet, which is Rs 3996. What will the total cost of the dinner be?

**SLOs**

For this activity, pupils will have to avoid writing. The following questions should be solved with mental math. The way it will work is that you will write a sum on the board and wait so that they can solve it in their heads. Once they have write the correct answer on the board, and ask pupils if they came to the same answer, and if not, what problems did they run into. Remind them that if they are getting the wrong answers you need to know so that you can help them. Here are some sums you can use as mental math questions. Do not go higher than 100.

<table>
<thead>
<tr>
<th>Sum</th>
<th>Answer</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 + 10</td>
<td>20</td>
</tr>
<tr>
<td>20 + 50</td>
<td>70</td>
</tr>
<tr>
<td>35 + 35</td>
<td>70</td>
</tr>
<tr>
<td>48 + 20</td>
<td>68</td>
</tr>
<tr>
<td>23 + 43</td>
<td>66</td>
</tr>
<tr>
<td>38 + 22</td>
<td>60</td>
</tr>
<tr>
<td>67 + 13</td>
<td>80</td>
</tr>
<tr>
<td>56 + 15</td>
<td>71</td>
</tr>
<tr>
<td>34 + 29</td>
<td>63</td>
</tr>
<tr>
<td>56 + 19</td>
<td>75</td>
</tr>
</tbody>
</table>

At the end of this activity ask pupils if they have any tricks for mental calculation that they want to share.

**Let’s Pause**

Pupils who did not get any right answers would benefit from practicing with single-digit numbers. Once they get to a place with single-digit numbers, where they always get the right answer, start to slowly add digits, but do not go higher than 100 at this point.

Refer to the textbook for more sums and assign classwork.

<table>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Since pupils now have an understanding of vertical addition, write on the board:

\[ 8392 - 6397 \]

Ask for volunteers who would be able to come to the front of the class and write this out vertically on the board. If you have a volunteer, help them write it out, and then solve it step by step, with the help of the class. It should look like this:

\[
\begin{array}{cccc}
8 & 3 & 9 & 2 \\
\hline
6 & 3 & 9 & 7 \\
\hline
1 & 9 & 9 & 5
\end{array}
\]

Go over this enough times so that the class understands exactly how you got the answer. Then divide the class into two; group A and group B. Have one bowl of chits with random 4-digit numbers under 5000, and another with 4-digit numbers over 5000. Have group A choose chits from one bowl, and the group B from the other bowl. Then ask all members of group A to pair up with members of group B, so that in each pair there will be a chit with a number over 5000, and a number under 5000. Ask the pairs to come to the front of the class, and, using the board, subtract the bigger number from the smaller number. They should try to solve it as a pair, but if they are stuck, then the class should help them. Tell them not to worry about needing help, because explaining an answer to someone is a good way for the other pupils to learn.

Let’s try it

Have pupils attempt real-life number stories up to four-digits, with, and without borrowing, making sure to show their working. Here are some examples:

1) Asim is going on a three-day hike that is 302 km. After three hours, he takes his first break, and a sign tells him he has 286 km left. How much did he walk in the first three hours?

2) Maria is given a gift card to a spa for her birthday for Rs 2500. She goes to the spa and gets a massage for Rs 4000. Since the value of the gift card will be removed from the bill, how much will Maria pay at the spa?

3) Faisal borrows Rs 1525 from Naveed. The next day, Faisal doesn’t have enough money, so he gives Naveed Rs 725. How much more does Faisal have to pay?

4) A school has 2400 pupils. On average, every day 42 children are absent. On average, every day, how many pupils are present?

5) Faiza has 350 employees in her office. She has decided to move 80 to another branch. How many employees will be left in the office?
Let's try it

Ask pupils to solve some multiplication questions. Start with a few single-digit numbers, and gradually start asking them to multiply single-digit numbers with two-digit numbers. Show them how to multiply vertically. Write on the board, $13 \times 8$ and ask the class if they can solve it quickly. Some might suggest simply adding thirteen 8 times, but tell them that there is a better way. Like vertical subtraction and addition, there is vertical multiplication. Solve the question on the board, step by step so that they can watch. It should look like this.

\[
\begin{array}{c}
  13 \\
  \times 8 \\
  \hline \\
  194
\end{array}
\]

Have them try a few more on the board, as a class.

For this activity, pupils will have to avoid writing. The following questions should be solved mentally. The way it will work is that you will write a subtraction number sentence on the board and wait for a few minutes so that they can solve it in their heads. Once the time has passed, write the correct answer on the board, and ask pupils if they came to the same answer, and if not, what problems did they run into. Remind them that if they are getting the wrong answers you need to know so that you can help them. Here are some sums you can use as mental math questions. Do not go higher than 100.

\[
\begin{array}{cc}
  20 \; - \; 10 & 20 \; - \; 5 \\
  75 \; - \; 35 & 67 \; - \; 22 \\
  78 \; - \; 20 & 56 \; - \; 15 \\
  23 \; - \; 12 & 34 \; - \; 29 \\
  38 \; - \; 15 & 96 \; - \; 24 \\
\end{array}
\]

At the end of this activity ask pupils if they have any tricks for mental subtraction that they want to share.

This pairs with Math Lab pages 15 to 18

Write the 6, 7, 8, and 9 multiplication tables on the board, but don’t write the answers. Quickly as go through up to fifteen multiplication equations, and ask pupils to raise their hands with the answer. The first one to raise their hand and answer correctly will get a point. Ask pupils to keep track of their points, and whoever has the most wins. Encourage them to copy the tables down so that they can go over them at home, and also so they have a better chance of retaining them. Once they are written down, read them aloud with the class.

Assign thirty minutes of classwork from the textbook.
Let's try it

Assign some division questions so that pupils can practice. Make sure to keep to single-digit numbers, with no remainder. Halfway through, ask pupils to stop using their notebooks, and try to do the calculations mentally. Here are some examples of questions. Since there are not a lot of one-digit division questions with no remainder, you may have to repeat some.

\[
\begin{align*}
5 \div 5 & \quad 8 \div 4 & \quad 3 \div 1 \\
9 \div 3 & \quad 6 \div 2 & \quad 8 \div 2
\end{align*}
\]
Let’s talk Math
This unit had a lot of focus on mental math. Ask pupils what they think of mental math, in terms of difficulty. If they say it was difficult, ask them if they think that is so because it is a new concept, and if they think practice might eventually make it easy. After they discuss this, ask if even though it might be very hard, how do they think it would help them to come up with answers to calculations without needing a pencil and paper. Ask them if any of them can think of a way in which mental math might help them in life. Ask them to take two minutes to think, and try to come up with a story about someone who solves problems using mental math. Allow pupils to tell the stories they come up with, making sure they’re short, and at the end of the discussion, ask them to take 5 minutes to write a reflective essay.

Let’s get practical
Separate the class into groups of 4 to 5 pupils. Hand out fake receipts to pupils, looking something like this:

<table>
<thead>
<tr>
<th>No. of Items</th>
<th>Item</th>
<th>Cost per Item</th>
<th>Cost for Items</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Pencil</td>
<td>10</td>
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</tr>
<tr>
<td>1</td>
<td>Eraser</td>
<td>15</td>
<td>45</td>
</tr>
<tr>
<td>3</td>
<td>Book</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Marker</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

Total cost 269  
Total Paid 300  
Change

Ask them to fill in the blanks using whatever number operations they think might help. You might need to explain the categories to them.
Self Assessment

2.1. Addition
2.2. Subtraction
2.3. Multiplication
2.4. Division

<table>
<thead>
<tr>
<th>Refer to</th>
<th>Confusion level</th>
<th>1 – Does not understand any concept</th>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

Multiple Choice Questions

Read out the questions or write them on the board. You may ask pupils to either write the correct answer on a white board and hold it up or call out the options one by one, asking them to raise their hands to show which one they have chosen.

1) Calculate the following mentally: $26 + 33$.
   a) 69
   b) 59
   c) 70
   d) 50

2) Calculate the following mentally: $25 \times 3$.
   a) 75
   b) 65
   c) 80
   d) 100

3) Calculate the following: $81 \div 9$.
   a) 9
   b) 10
   c) 12
   d) 7
Unit 3

Fractions

3.1. Common Fractions
i. Express the fractions in figure and vice versa.
ii. Match the fractions with related figures.

3.2. Proper and improper fractions
i. Recognize proper and improper fractions.
ii. Differentiate between proper and improper fractions.

3.3. Equivalent Fractions
i. Identify equivalent fractions from the given figures.
ii. Write three equivalent fractions for a given fraction.

3.4. Comparing Fractions
i. Compare fractions with same denominators using symbols “<”, “>”, or “=”.

3.5. Addition of Fractions
i. Add two fractions with same denominators.
ii. Represent addition of fractions through figures.

3.6. Subtraction of fractions
i. Subtract fractions with same denominators.
ii. Represent subtraction of fractions through figures.

Plan Ahead:
Common Fractions 6 lessons
Proper and improper fractions 5 lessons
Equivalent Fractions 5 lessons
Comparing Fractions 5 lessons
Addition of Fractions 6 lessons
Subtraction of fractions 6 lessons

Before You Start:
Pupils already know that a fraction is a part of a whole. They are familiar with $\frac{1}{2}$ s and $\frac{1}{4}$ s, as used in everyday life. They are gradually introduced to other fractions, starting with the simplest: $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, and $\frac{1}{5}$ … With practical work, addition and subtraction of like fractions are also introduced.

Watch Out For:
Pupils might find it confusing that a fraction’s denominator is not affected when added and subtracted, and may also not understand the difference between the numerator and the denominator.
This Pairs with:
Math Lab 3, pages 23 to 38.

Make Sure You Have:
Bowl     Chits
Chart paper   Coloured pencils in a pack
Boxes     Strips of paper

If they’re Struggling:
Pupils have worked with fractions before, so it is unlikely that they won't be comfortable. Keep reminding them that fractions are numbers and so calculating with them is no different from calculating with regular numbers. For pupils who are quite stuck, ask them to take a moment to draw fractions discs, or fraction bars. When you see the confusion bar, take note of how many pupils fall under each level. If pupils are at a level 3 or below, have them solve the equivalent Math Lab pages in pairs, having weaker students work with more confident students. First do allow the class to collectively ask questions. If all pupils are at a 4 or above, move on to the next activity.

Let’s Begin
A fraction is a number that represents a part of a whole. The lower number indicates the number of equal parts a whole (or a collection) has been divided into. It is called the denominator. The top number indicates the number of those equal parts are being referred to. It is called the numerator. When the numerator and denominator are multiplied by the same number (except 0), we get an equivalent fraction. Fractions with the same denominator are called like fractions. In unlike fractions with the same numerator, the smaller the denominator, the greater is the value of the fraction. To add like fractions, add only the numerators. The denominator remains the same. To subtract a fraction from another like fraction, subtract the smaller numerator from the larger one. The denominator still remains the same.
Divide the class into pairs. Provide each pair with blank paper chits (4 to 5) Each pair will write some proper and improper fractions on the given blank chits and give it to the other pair. The other pair will now sort out the proper and improper fractions and place them in the tagged boxes accordingly. Make sure every pair has some fractions to sort into boxes. Check the boxes in the end for any wrong placements.

<table>
<thead>
<tr>
<th>Proper Fraction</th>
<th>Improper Fraction</th>
</tr>
</thead>
</table>

Assign 25 minutes of classwork from the textbook.

**Activity 1**
10 minutes
Chits
Boxes

This pairs with Math Lab pages 23 and 24
To familiarise the pupils with the concept of fractions as part-part-whole, draw the following on the board:

1)  
6)  

2)  
7)  

3)  
8)  

4)  
9)  

5)  
10)  

Go through them with the class and ask them to help you figure out which fractions apply to which shape. As homework, ask them to find one thing in their homes that they could use a fraction to describe. Remind them that this could be anything. The number of socks they have that are a certain colour (the fraction would be the number of coloured socks over the total number of socks), or even the number of males in their family out of the total number of family members.
Assign 25 minutes of classwork from the textbook.

Fill a bowl with chits with various fractions. Make sure there are both proper and improper fractions, but make sure that they can all be simplified to have the same denominator. Ask each pupil to pick a fraction out of the bowl, and using a chart paper, create a drawing that they think illustrates their fraction. Then call pupils at random to the front of the class and ask them to hide their drawings. At the count of three, both pupils will hold up their chart papers, and the class will have to decide whose fraction is greater. The first one to have their hand up should answer the question.

**Let's try it**

Present a series of pairs of fractions and ask pupils to decide which is greater, lesser, or equal using these signs <, >, =. Make sure to only give them pairs with the same denominator, or that can be simplified to have the same denominator. Here are some examples below:

1) \( \frac{5}{10} \) and \( \frac{7}{10} \)  
2) \( \frac{8}{32} \) and \( \frac{25}{32} \)  
3) \( \frac{20}{100} \) and \( \frac{40}{200} \)  
4) \( \frac{12}{3} \) and \( 7 \frac{1}{3} \)  
5) \( \frac{1}{2} \) and \( \frac{2}{4} \)  
6) \( \frac{27}{9} \) and \( \frac{10}{18} \)  
7) \( \frac{5}{35} \) and \( \frac{11}{70} \)

Introduce students to other fractions with the use of strips of paper, coloured circles, or even a pack of coloured pencils. Use one shape at a time, but the same fraction must be demonstrated with different shapes, so that children see a fraction associated with any shape or any set of objects. Associate the fractions and fraction names.

- 2 equal parts: 2 halves in a whole
- 3 equal parts: 3 thirds in a whole
- 4 equal parts: 4 quarters in a whole
- 10 equal parts: 10 tenths in a whole
- 100 equal parts: 100 hundredths in a whole

Use this activity to explain equivalent fractions. Remind pupils that two quarters are one half, which is why \( \frac{1}{4} \) is equal to \( \frac{1}{2} \). Ask them for other examples of equivalent fractions.

Assign 25 minutes of classwork from the textbook.
Let’s try it

Ask pupils to write down three equivalent fractions for the following:

\[
\frac{5}{10}, \frac{3}{9}, \frac{63}{70}, \frac{18}{25}, \frac{13}{15}
\]

**SLOs**

<table>
<thead>
<tr>
<th>Activity 5</th>
<th>15 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>3.5</strong></td>
<td></td>
</tr>
<tr>
<td>i</td>
<td></td>
</tr>
<tr>
<td>ii</td>
<td></td>
</tr>
</tbody>
</table>

**Activity 5**

Write on the board:

\[
\frac{2}{10} + \frac{4}{10}
\]

Since pupils have not added fractions before, they will need help solving it. To help them, ask a volunteer to come to the front of the board and help them draw, either fraction discs or fractions bars to represent each fraction. It should look like this:

\[
\text{Diagram}
\]

Use these diagrams to explain how the addition works. Explain that when fractions have the same denominator they can be added, and that using figures can make the addition easier to understand. The answer will be \(\frac{6}{10}\), shown by:

\[
\text{Diagram}
\]

Here pupils should be able to see how you came to this answer. Solve up to five more addition sums on the board.

**Activity 6**

Write on the board:

\[
\frac{5}{10} + \frac{4}{10}
\]

Since pupils have not subtracted fractions before, they will need help solving it. To help them, ask a volunteer to come to the front of the board and help them draw, either fraction discs or fractions bars to represent each fraction. It should look like this:

\[
\text{Diagram}
\]

Use these diagrams to explain how the subtraction works. Explain that when fractions have the same denominator they can be added and subtracted, and that using figures can make the subtraction easier to understand. The answer will be \(\frac{1}{10}\), shown by:

\[
\text{Diagram}
\]

Here pupils should be able to see how you came to this answer. Solve up to five more subtraction questions using fractions of the same denominator on the board.
Let’s talk Math

Fractions are used for baking. It is important to have precise measurements when cooking and often, even though we have units, we must be able to divide them accurately. Fractions can also help with portion size. Also point out that when we tell time in hours and minutes, or work with most units, we are constantly using fractions without even realising it, because a minute is \( \frac{1}{60} \) of an hour. For all things that need to be measured precisely, like doctors’ prescriptions to tell how much of a medicine to take, especially the quantity of syrup. Games like soccer, football, and basketball, are also split into halves and quarters, as they are the easiest way to divide something. Ask pupils to think about other places in their lives where fractions may be present that they may not have realised. At the end of the discussion, give them five minutes to write a reflective paragraph.

Let’s get practical

Distribute chart paper and ask pupils to cut out circles and take 5 minutes to draw pizzas. Make sure they have divided the pizza into 6 slices by drawing lines on the circle. Then ask each pupil to roll a six-sided dice and having obtained a number between one and six, write that number on the back of the pizza, over 6. So, for example if the number on the dice was 2, the fraction on the back of the pizza would be \( \frac{2}{6} \). This will signify that \( \frac{2}{6} \) of the is leftover because four slices were eaten, so pupils should be sure to cross out the number of slices that have been eaten on their drawings. Once all the pizzas are done, organise them face down in a straight line so that all the fractions are visible. Each pupil should add all the fractions together, and using only the fractions, work out how many slices are leftover in total. Given that it is a long addition sentence, it will not be surprising if some of the class has varying answers. Once everyone has an answer, flip the pizzas so that the sides with the fractions are down, and count, out loud with the pupils, how many slices are left. See how many pupils were able to reach the correct answer using only the fractions.
Multiple Choice Questions

Read out the questions or write them on the board. You may ask pupils to either write the correct answer on a white board and hold it up or call out the options one by one, asking them to raise their hands to show which one they have chosen.

1) What fraction correctly describes this circle?

   a) \( \frac{1}{2} \)
   
   b) \( \frac{5}{10} \)
   
   c) \( \frac{3}{6} \)
   
   d) All of the above

2) \( \frac{3}{7} \) and \( \frac{4}{7} \)

   a) <
   
   b) >
   
   c) =

3) Choose an equivalent fraction for \( \frac{5}{6} \).

   a) \( \frac{5}{60} \)
   
   b) \( \frac{50}{6} \)
   
   c) \( \frac{10}{12} \)
   
   d) All of the above.
Unit 4

Measurement: Length, Mass, and Capacity

4.1. Length

i. Use standard metric units of length (kilometre, meter, and centimetre) including abbreviations.

ii. Add measures of length in same units without carrying.

iii. Solve real-life situations involving same units of length for addition without carrying.

iv. Subtract measures of length in same units without borrowing.

v. Solve real-life situations involving same units of length for subtraction without borrowing.

4.2. Mass

i. Use standard metric units of mass (kilogram and gram) including abbreviations.

ii. Add measures of mass in same units without carrying.

iii. Solve real-life situations involving same units of mass for addition without carrying.

iv. Subtract measures of mass in same units without borrowing.

v. Solve real-life situations involving same units of mass for subtraction without borrowing.

4.3. Capacity

i. Use standard metric units of Capacity (litre and millilitre) including abbreviations.

ii. Add measures of capacity in same units without carrying.

iii. Solve real-life situations involving same units of capacity for addition without carrying.

iv. Subtract measures of capacity in same units without borrowing.

v. Solve real-life situations involving same units of capacity for subtraction without borrowing.

Plan Ahead:

Length 6 lessons
Mass 6 lessons
Capacity 6 lessons

The approximate duration of this unit should be 18 lessons.

Before You Start:

The pupils are able to solve word problems involving addition and subtraction with length, weight and capacity. (They are already familiar with the use of the four operations). Now they will learn to add and subtract the units of measurement by carrying the smaller unit to the bigger unit and borrowing from the bigger unit.
Watch Out For:
Avoid moving too quickly with this unit. Although pupils are familiar with all the mathematical concepts, they have a lot of new terminology given to them, which can be intimidating.

This Pairs with:
Math Lab 3, page 39 to 40.

Make Sure You Have:
Water containers   Weights
Metre ruler  Measuring cups

If they’re Struggling:
Pupils may need to revise the abbreviations at the start of each lesson. A good idea would be to put up a chart paper in the classroom, for the duration of this unit so that pupils can refer to it. Seeing it regularly will also help them retain it. You might like to use flashcards to reinforce them. When you see the confusion bar, take note of how many pupils fall under each level. If pupils are at a level 3 or below, have them solve the equivalent Math Lab pages in pairs, having weaker students work with more confident students. First do allow the class to collectively ask questions. If all pupils are at a 4 or above, move on to the next activity.

Let’s Begin
Measurement is very important in one’s every day life. It helps one be truly aware of ones surroundings. Ask pupils what comes to mind when they think of measurement? Who are measurements important for? The class will probably list professions that make use of measurements, but prompt them to discuss how almost everyone uses measurement in one way or another. Ask them why they think measurement has become so important. After they have each volunteered their answers, ask them to think of an instance where they have tried to guess instead of properly measuring, for example, adding too much of a particular ingredient when baking. If they do not have any such personal experiences, ask them to think of anyone they know who has.
Activity 1
10 minutes
metre ruler

Let's try it
Ask pupils to solve up to 20 addition questions using units like km, m, or cm. Here are some examples. Avoid carrying, and you may also refer to the textbook for more questions.

<table>
<thead>
<tr>
<th>20 m + 35 m</th>
<th>60 km + 5 km</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 cm + 68 cm</td>
<td>305 cm + 70 cm</td>
</tr>
</tbody>
</table>

Activity 2
20 minutes

Tell pupils a number story that involves subtraction and metres, centimetres, and kilometres. Repeat activity 1 with subtraction until they are comfortable, avoiding borrowing. Then, give the class 5 minutes, asking each pupil to come up with their own number story, preferably drawn from a real-life experience. Ask the class to listen as each pupil reads aloud their real-life example, which the other pupils should solve in their notebooks, while making sure to make note of the number sentence. Tell pupils that the subtraction should not require borrowing. At the end, ask pupils to peer review.

Activity 3
10 minutes
weights

Remind the class of the abbreviations; kg and g. Give them an example of each, perhaps showing weights that they can pass around a class. Tell them that as a class activity, you will be reading out number stories, one at a time, as pupils come to the board in pairs. One of the pairs will have to construct a number sentence, using units, and the other pupil in the pair will have to solve the number story, and thereby the number sentence, writing their answer on the board, being sure to include the units. Try to make the stories as realistic as possible, and avoid addition that requires carrying.

Activity 4
20 minutes

Tell pupils a number story that involves subtraction and weight units. Give the class 5 minutes, asking each pupil to come up with their own number story, preferably drawn from a real-life experience. Ask the class to listen as each pupil reads aloud their real-life example, which the other pupils should solve in their notebooks, while making sure to make note of the number sentence. Tell pupils that the subtraction should not require borrowing. At the end, ask pupils to peer review.
Let's try it
Ask pupils to solve up to 20 addition questions using units like or, ml. Here are some examples. Avoid carrying, and you may also refer to the textbook for more questions.

<table>
<thead>
<tr>
<th>Addition</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 l + 6 l</td>
<td>40 ml + 45 ml</td>
</tr>
<tr>
<td>60 ml + 5 ml</td>
<td>305 l + 73 l</td>
</tr>
<tr>
<td>84 ml + 15 ml</td>
<td></td>
</tr>
</tbody>
</table>

Let's try it
Ask pupils to solve up to 20 addition questions using units like kg or g. Here are some examples. Avoid carrying, and you may also refer to the textbook for more questions.

<table>
<thead>
<tr>
<th>Addition</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 kg + 35 kg</td>
<td>27 kg + 11 kg</td>
</tr>
<tr>
<td>21 g + 68 g</td>
<td>42 kg + 5 kg</td>
</tr>
<tr>
<td>403 g + 60 cg</td>
<td></td>
</tr>
</tbody>
</table>

Remind the class of the abbreviations; l and ml. Give them an example of each, showing water containers and telling them their capacity. Tell them that as a class activity, you will be reading out number stories, one at a time, as pupils come to the board in pairs. One of the pairs will have to construct a number sentence, using units, and the other pupil in the pair will have to solve the number story, and thereby the number sentence, writing their answer on the board, being sure to include the units. Try to make the stories as realistic as possible, and avoid addition that requires carrying.

Draw three swimming pools on the board. Tell pupils that the smallest one has 50 litres, the middle one has 100l, and the largest has 300l. If a family of three is planning on going swimming in all three pools, and they’re planning on splashing a lot of water, ask pupils to figure out how much water will be left in the pools. Explain that the father splashes out 5 litres of water in every pool, while the mother splashes out 3 litres. The child splashes much more than his parents so he splashes out 8 litres. After the family has played in all three pools, ask the class to figure out how much water will be left in each pool. Once it is solved, ask the class to come up with their own number stories involving l and ml.
**Let’s try it**

A zoo is closing and is transporting its animals in containers to various locations. Currently they have five containers, containing 5 animals each. The weight of each container is as follows:

- Zebras – 1200 kg
- Tigers – 600 kg
- Apes – 450 kg
- Giraffes – 4000 kg
- Meercats – 480 g

Today they will be offloading two zebras who weigh 250 kg and 300 kg, one tiger who weighs 180 KG, three Apes who weigh 150 kg, 70 kg, and 60 kg, two giraffes who weigh 890 KG and 920 K, and one meercat who weighs 70 g. How much will each container weigh once these animals have offloaded?

---

**Let’s talk Math**

Ask pupils if they know how tall they are. And how tall the were last year. If they don’t, ask them if their parents keep track. Some might say yes. Explain that keeping track of your height and the amount and speed that it changes at every year is something important that people do. Our heights are a significant identifying feature. Measurement allows us to document and record things, and also to recreate exact proportions. For example, if you made an amazing cake, and wanted to tell your friend the recipe, standard units would allow him or her to recreate what you made exactly, whereas non-standard units could potentially lead to a completely different creation.

---

**Let’s get practical**

Make the class into groups of 3 to 5. Hand out various water containers at random, making sure to give at least one to each student, and a measuring cup to each group. Ask them to each calculate the total capacity of all of their containers. This means that they will have to use the measuring cup to determine the capacity of each bottle, by seeing how many times it needed to be filled. Once they have calculated a total, ask them to show their work, as well as the individual capacities of the containers. Be mindful of how much water is wasted.
Self Assessment

4.1. Length
4.2. Mass
4.3. Capacity

Multiple Choice Questions
Read out the questions or write them on the board. You may ask pupils to either write the correct answer on a white board and hold it up or call out the options one by one, asking them to raise their hands to show which one they have chosen.

1) If Maryam has a 30 kg suitcase, and her sister has a 25 kg suitcase, how much more does Maryam’s suitcase weigh.
   a) 5 kg
   b) 5 g
   c) 25 kg
   d) 10 kg

2) What does kg measure?
   a) Capacity
   b) Mass
   c) Distance

3) What does the unit l measure?
   a) Capacity
   b) Mass
   c) Distance

Confusion level

<table>
<thead>
<tr>
<th>Refer to Confusion level</th>
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<th>If pupil is below 3 use Math Lab</th>
</tr>
</thead>
<tbody>
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<td></td>
<td></td>
<td></td>
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<td></td>
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</tbody>
</table>

Confusion level

1 –Does not understand any concept
2 - Does not understand most of the concepts
3 - Understands some concepts but has questions
4 - Understands all the concepts, just needs more practice
5 - Feels confident solving questions

If pupil is below 3 use Math Lab
Unit 5

Time

5.1. Time

i. Use a.m. and p.m. to record the time from 12-hour clock.
ii. Read and write time from analogue and digital clocks.
iii. Read and write days and dates from the calendar.
iv. Add measures of time in hours
v. Solve real-life situations involving measures of time for addition of hours.
vi. Subtract measures of time in hours.
vii. Solve real-life situations involving subtraction of measures of time in hours.

Plan Ahead:

Time 9 lessons
The approximate duration of this unit should be 9 lessons

Before You Start:
Pupils should be comfortable with digital and analogue clocks, and will be able to read time, but have no experience calculating with it.

Watch out for:
Pupils will need to get used to the idea that the numbers pointed to by the minute hand need to be multiplied by 5. Memorising the 5 times table might make this easier.

This Pairs with:
Math Lab 3, page 42 to 50.

Make Sure You Have:
Analogue Clock Calendar
Digital Clock

If they’re Struggling:
Pupils are familiar with the clock-face and know how to read time half past the hour, quarter past the hour and on the hour. They have a fair idea about simple fractions and are able to skip-count in fives. Pupils can read time in hours, and, with some help, in minutes. With a little practice, they will be able to use a.m. and p.m. and read the clock face accurately. When you see the confusion bar, take note of how many pupils fall under each level. If pupils are at a level 3 or below, have them solve the equivalent Math Lab pages in pairs, having weaker students work with more confident students. First do allow the class to collectively ask questions. If all pupils are at a 4 or above, move on to the next activity.
Let's Begin
Ask pupils what role planning plays in their lives. Do they like to plan, or do they find it difficult? Ask them to come up with examples of how planning has improved their lives, or, not and of how they might even need on planning. Then ask them for examples of how planning has made their lives more difficult. Ask them if they think it would be possible to plan ahead all the time. Ask pupils to get creative and think of other ways of measuring time.

<table>
<thead>
<tr>
<th>SLOs</th>
<th>Activity 1</th>
<th>Let's try it</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.1</td>
<td>Hold up an analogue clock in front of the class and ask them what time it shows. Then do the same with a digital clock. Ask pupils if they think that they should write a.m. or p.m. in front of these times. Discuss how one would be able to tell if the time could be distinguished as either. Point out that we can tell this by looking at the sky, or by thinking about how much of the day has gone by. a.m. is for the first half of the day, and p.m. is for the second half.</td>
<td></td>
</tr>
<tr>
<td>i</td>
<td>Analogue clock</td>
<td></td>
</tr>
<tr>
<td>ii</td>
<td>Digital clock</td>
<td></td>
</tr>
</tbody>
</table>

**Activity 2**
15 minutes
Calendar

**This pairs with Math Lab pages 42 to 44**
Compile a list of all the pupils' birthdays and share it with the class. Make groups of three to five pupils and ask them to use a calendar to figure out what day of the week each of their classmates' birthdays fall on. Ask them to make a table that includes all the pupils.

Refer to If they're struggling

<table>
<thead>
<tr>
<th>Number of Pupils</th>
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</tbody>
</table>

If pupil is below 3 use Math Lab

Oxford University Press
SLOs

Activity 3

Using an analogue clock, set the time to 1. Ask pupils what time it shows. After they give you the answer, ask them what time it would be three hours after this. Then, pointing at the numbers on the clock, count three ahead, and get to 4. Point out that calculating a later time is the same as addition. Move the clock forward to 4 and ask for a few more calculations. Move to the board and start to write out the calculations like number sentences. Give pupils up to twenty questions that require them to add time in measures of hours, to solve as a class. Here are a few examples of questions you can ask.

1) 1 o'clock + 3 hours =
2) 7 o'clock + 5 hours =
3) 6 o'clock + 12 hours =
4) 4 o'clock + 8 hours =
5) 5 o'clock + 5 hours =
6) 9 o'clock + 6 hours =
7) 8 o'clock + 8 hours =
8) 12 o'clock + 14 hours =
9) 12 o'clock + 13 hours =
10) 8 o'clock + 9 hours =

Make sure to explain the difference between 12 am and 12 pm.

Let's try it

Present pupils with a series of real-life scenarios involving the addition of hours to solve individually. They should develop the problems into number sentences, and solve them as equations, making sure to write a.m. or p.m.

Here are some examples scenarios you can give them:

1) If Alina gets to work at 8 a.m., and leaves 2 hours later, what time will she leave?
2) At a bakery, they allow the dough to sit at room temperature for three hours before baking it. If the three hours started at 5 p.m., when will it go in the oven?
3) Haider asks his mother if he can visit his friend for 6 hours so that they can have a movie marathon. If Haider is dropped off at 11 a.m., what time will he be picked up?
4) Jehanzeb is going on a long road trip by himself and decides to share his location with his family. At 6 a.m., he shares his location for 5 hours. At what time will the location expire?
5) A machine in a factory can run for 7 hours before it has to charge. If it is turned on at 4 o'clock when will it need to charge?

Assign 15 minutes of classwork from the textbook.
Hold up an analogue clock and ask pupils if they would be able to subtract using hours. Explain that just like addition, where they counted forward on the clock, to subtract they just need to count backwards on the clock. Solve the following questions on the board:

1) 2 o’clock – 5 hours =
2) 12 o’clock – 12 hours =
3) 6 o’clock – 6 hours =
4) 4 o’clock – 10 hours =
5) 5 o’clock – 5 hours =
6) 9 o’clock –12 hours =
7) 8 o’clock – 10 hours =
8) 11 o’clock –14 hours =
9) 12 o’clock –13 hours=
10) 7 o’clock – 9 hours =

Make sure all the pupils are participating in the solution.

Let’s try it

Present pupils with a series of real-life scenarios involving the subtraction of hours to solve individually. They should develop the problems into number sentences, and solve them as equations, making sure to write a.m. or p.m.

Here are some examples scenarios you can give them:

1) If at 10 a.m. you have been awake for 3 hours, what time did you wake up?
2) At 8 p.m. Ali and his mother finish making dinner for their family. It took them 5 hours to do all the prep and cooking, so what time did they start?
3) Alam is 2 hours late to school because he is having car trouble. If he reached school at 10 a.m. what time did school start?
4) Two flight land on the same day at the same airport, only 7 hours apart. The second one lands at 4 p.m. What time did first one land?
5) Hassan is staying up late to finish some work that it will take him 9 hours to do. He finishes at 4 a.m. so what time did he start?

Let’s talk Math

In the unit opener, pupils discussed alternate ways of measuring time, and how to plan ahead without using time. They also discussed whether time made their lives harder or easier. Ask the class if any of them have changed their minds after having learnt more about time. At the end of the discussion, allow five minutes so that they can write a reflective paragraph about what the learnt.

Let’s get practical

Ask pupils to create a week planner showing the days of the week, and the dates, showing a timetable for each day. Make sure that there are exactly 7 days on each calendar, and that every hour of the day is shown. Encourage creativity and accuracy, where the dates are concerned.
Multiple Choice Questions

Read out the questions or write them on the board. You may ask pupils to either write the correct answer on a white board and hold it up or call out the options one by one, asking them to raise their hands to show which one they have chosen.

1) If Alia has kept a fast for 14 hours, and her fast opened at 7 p.m. what time did she start?
   a) 6 a.m.
   b) 5 a.m.
   c) 10 a.m.
   d) 9 a.m.

2) Hassan’s mother says he needs to wait two hours after eating to swim. He finishes his lunch at 2pm, so what time can he swim?
   a) 4 p.m.
   b) 5 p.m.
   c) 4 a.m.

3) If Arshad says he has dinner at 7, would he mean:
   a) p.m.
   b) a.m.
   c) It could be either
Unit 6

Geometry

6.1. Geometrical Shapes

i. Draw and measure line segments to the nearest centimetre and millimetre.
ii. Recognize point, line, ray, and line segment.
iii. Classify figures according to number of sides as quadrilaterals (rectangles, squares and triangles).
iv. Calculate perimeter of square, rectangle, and triangle.
v. Identify centre, radius and diameter of a circle.

6.2. Symmetry

i. Identify reflective symmetry in two-dimensional (2-D) shapes.
ii. Identify and draw lines of symmetry.

6.3. Three Dimensional (3-D) Objects

i. Describe 3-D objects (cubes, cuboids, and pyramids) with respect to the number of edges and faces.
ii. Differentiate 3-D objects (cubes, cuboids, and pyramids) with respect to the number of edges and faces.

Plan Ahead:

Geometrical Shapes 6 lessons
Symmetry 4 lessons

The approximate duration of this unit should be 10 lessons.

Before You Start:

Pupils are already familiar with shapes, and measurement. They should be comfortable using units and making calculations. They also know how to draw lines correct to a certain measure.

Watch Out For:

Many new concepts are introduced in this unit and there may be confusion about why a circle is measured differently from other shapes. Although perimeter is new, the level of it in this unit should not be too challenging as long as you move slowly. For both these things, pupils simply need to become familiar with the ideas and practice will facilitate this.

This Pairs with:

Math Lab 3, page 45 to 54.
**Make Sure You Have:**
- Tape measure
- A4 sheet
- Rulers
- Large graph paper
- Chits

**If they’re Struggling:**
Since it will be difficult to remember how to differentiate between different kinds of lines, it may help to put up labelled displays that show all of them, and also to relate them to real life. When you see the confusion bar, take note of how many pupils fall under each level. If pupils are at a level 3 or below, have them solve the equivalent Math Lab pages in pairs, having weaker students work with more confident students. First do allow the class to collectively ask questions. If all pupils are at a 4 or above, move on to the next activity.

**Let’s Begin**
Ask pupils about the geometry they have studied previously. Ask them if they have used it at all in their lives. If they say yes, ask for examples, but if they say no, ask them if they think that is because their lives don’t involve geometry, or that the geometry that they have learned so far is not helpful. Can they think of any examples of people who do need to use geometry in their daily lives, or at all? To remind them about the shapes they have learned, take five minutes for the class to play I spy with shapes, by spotting shapes around the classroom.

<table>
<thead>
<tr>
<th>SLOs</th>
<th>Activity 1</th>
<th>Activity 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>6.1</td>
<td>10 minutes</td>
<td>10 minutes</td>
</tr>
<tr>
<td>i</td>
<td>Rulers</td>
<td>Rulers</td>
</tr>
<tr>
<td></td>
<td>A4 sheets</td>
<td>A4 sheets</td>
</tr>
</tbody>
</table>

Pass a set of rulers around the class that show centimetres and millimetres. Explain to the class that a millimetre is a tenth of a centimetre. Allow them to get an idea of both measurements by looking at the rulers, and once they are done, divide the class into 2; group A and group B. Give pupils on both sides one A4 sheet each, and give each side a up to ten different measurements in centimetres or millimetres. They should each then, draw line segments correct to those measurements, but should not label the lines. Then collect all the sheets, keeping group A’s separate from group B’s, and then distribute all of group A’s sheets to group B, and vice versa. Once each pupil has received a sheet with lines already drawn on it, they should use their ruler to measure each line, and draw another line of the exact same length on the other side of the sheet, and label it by length. At the end of this activity, each group should have identical sheets. Ask group members to stand and read out the lengths that the measured and ask if anyone has anything different.

This pairs with Math Lab pages 45 to 48
On the board, draw a line, a ray, a point, and a line segment. Go one by one and ask pupils if they can identify any of them. Start with the line, which pupils will probably correctly identify, and then move on to the point. Some may call it a dot, so explain that it is a point. When you get to the segment and the ray, pupils might not be able to differentiate between them and a regular line. Explain that a line segment is a line between two points. It can not be extended any further from either side. A ray is a line that starts at a point and extends indefinitely. It can be extended in one direction only. Now you will come back to the line. Pupils will have previously correctly identified it as a line but will not know what its defining characteristics are. A line can be extended infinitely in either direction.
Draw on the board, a square, a rectangle, and a triangle. Ask pupils to identify the number of sides for each one. Point at each shape one by one, allowing the class to shout out the answer. After they’ve all been written down, point out that both the square and the rectangle have 4 sides. Ask pupils if they know what a four-sided shape is called. Clarify that you mean any shape with four sides, even if it is not a square or a rectangle. If anyone knows the word quadrilateral, allow them to do their best to explain it to the rest of the class. Once they finish, add any information they left out. If no one knows, then explain that “quad” means 4, and quadrilateral refers to a four sides figure. Be very clear that this is the only characteristic for a shape to identify as a quadrilateral. Ask each pupil, to draw a quadrilateral in their notebooks. It could be a square or a rectangle, or it could be something from their imagination. If it has four sides, it is a quadrilateral.

Place a large sheet of graph paper on the ground. Ask pupils to gather around and draw a square on the paper, making sure to align it with the graph. Then ask them to count the number of squares on each side so that you can label them. Now explain that perimeter is the boundary of a closed shape. To find the perimeter of a shape, start from a point and add all sides clockwise or anti-clock-wise until you reach the point from where you started. Add all the sides, out loud along with the class, and when you get to your total, explain that it is the perimeter. Make squares, rectangles, and triangles of different sizes on your classroom’s floor using tape and mark them A, B, C, and so on. Divide the class into groups of 4. Write A, B, C etc. on chits, fold them and ask each group to pick one chit. Each group will calculate the perimeter of the composite shape mentioned on their chit. Two groups can be given the same shape as well so that they can compare their answers in the end.

Let’s talk Math
Ask each pupil to choose a room in the school that is easily accessible. Allow them some time to go into the rooms and get measurements. They will need a tape measure. Explain that they should make a rough drawing of the shape of the room in their notebooks and add measurements as they collect them. Once they have all the sides, they may come back to class and work out the perimeter of the room.

Let’s get practical
Area and perimeter play an important role in our daily lives. Whenever we want to cover a room’s floor with tiles or carpet, we need to calculate the area of the floor. Similarly, in construction of any building or any infrastructure we need to know its perimeter and area. Ask pupils if they can think of any uses of perimeter in real-life. At the end of the discussion, allow five minutes so that they may write a reflective paragraph about what they learnt in this unit.
Multiple Choice Questions

Read out the questions or write them on the board. You may ask pupils to either write the correct answer on a white board and hold it up or call out the options one by one, asking them to raise their hands to show which one they have chosen.

1) Which of the following is this line? (Draw a ray on the board)
   a) Ray
   b) Line
   c) Line Segment
   d) None of the above

2) Which of following two statement are true for a quadrilateral is?
   a) Any three-sided figure
   b) Any four-sided figure
   c) A shape with all straight lines

3) A line that goes across a circle measures what?
   a) The radius
   b) The diameter
   c) The perimeter
Unit 7

Data Handling

7.1. Data Representation

i. Representation of data by
   • Carroll diagram
   • Tally chart

ii. Read and interpret a Carroll diagram and tally chart.

iii. Read and interpret picture graph.

Plan Ahead:

Data Representation 5 lessons

The approximate duration of this unit should be 5 lessons.

Before You Start:

Pupils will not have handled data representation before but will be familiar with the concept of representing a value with a figure. Even if they did not realise many of the figures involved in previous units were graphs and charts that pupils were able to understand.

This Pairs with:

Math Lab 3, page 54 to 55.

Make Sure You Have:

Chart paper
Building blocks

If they’re Struggling:

Pupils will need to relate the idea of data handling to their real lives. They will also need to understand that collecting data is just like making a list, and the different kinds of diagrams only offer different ways to do that. When you see the confusion bar, take note of how many pupils fall under each level. If pupils are at a level 3 or below, have them solve the equivalent Math Lab pages in pairs, having weaker students work with more confident students. First do allow the class to collectively ask questions. If all pupils are at a 4 or above, move on to the next activity.
Let’s Begin

Ask pupils how many siblings each of them has in their family. As they answer create a tally chart to show the total number of siblings in the class. Explain that this is a tally chart, used to keep track of how many of something there are. The tallies will be easier to count because they are in fives, much like an analogue clock.

**SLOs**

<table>
<thead>
<tr>
<th>7.1</th>
<th>Activity 1</th>
<th>20 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>Create groups of up to five pupils and hand out building blocks. Ask the class, as a whole to find something that they think they could use to create a collection of data. This would have to be a question for their classmates, like the one used in the Let’s Begin. For example, how many books has everyone in the class read this year, or how many pencils does everyone have in their pencil cases. Encourage pupils to be creative and use their imagination, but to keep the values low. Once they have collected their information, ask them to count it out in blocks. So, for example, the question is of how many pencils they each have, each group will count up the total number of pencils they have between them, and put that number of blocks at the front of the class. Once every group has put their blocks, ask the class what the total number of blocks is. How many pencils does the class have altogether. They won't be able to say without counting the blocks by hand. Now write the same data on the board, in the form of a tally chart, by asking groups to tell you one by one, how many pencils. Once it is done, point out how much quicker it is to read the tally chart, and explain that this is why we use charts and graphs.</td>
<td></td>
</tr>
<tr>
<td>ii</td>
<td>This pairs with Math Lab page 55</td>
<td></td>
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</tbody>
</table>

Let’s try it

Ask each pupil to choose a story book that they feel they could find enough data in to create a tally chart. Ask them to construct them on chart paper and write on top which story they have based it on, and what it shows. Once they are done, put them up around the class, and allow them to explore each other’s approaches.

<table>
<thead>
<tr>
<th>7.1</th>
<th>Activity 2</th>
<th>10 minutes</th>
</tr>
</thead>
<tbody>
<tr>
<td>i</td>
<td>This pairs with Math Lab page 55</td>
<td></td>
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<tr>
<td></td>
<td>A Carroll diagram is a chart with four squares that can sort things into two different categories. Ask pupils to come up with something like this in the classroom that could be sorted into two categories. One example is glasses and gender. Create a Carroll diagram on the board, and on the top two squares write “girls” and “boys” and on the side, write “glasses” and “no glasses”. Now fill it in the squares with pupils’ names, asking them to help you. As homework, ask them to create a Carroll diagram in their notebooks to show data that they have collected in their daily lives.</td>
<td></td>
</tr>
</tbody>
</table>

Refer to If they’re struggling

<table>
<thead>
<tr>
<th>Confusion level</th>
<th>1 – Does not understand any concept</th>
<th>2 – Does not understand most of the concepts</th>
<th>3 – Understands some concepts but has questions</th>
<th>4 – Understands all the concepts, just needs more practice</th>
<th>5 – Feels confident solving questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Pupils</td>
<td>If pupil is below 3 use Math Lab</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>
SLOs

Explain to pupils what a picture graph is and draw the following on the board:

<table>
<thead>
<tr>
<th>Day</th>
<th>Oranges picked</th>
</tr>
</thead>
</table>
| Day 1  | 🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🍊🌟

Help pupils interpret this picture graph to answer pupils the following questions.

1) How many oranges did the farmer pick on the fourth day

2) Which day did the farmer pick the most oranges?

3) Which days did the farmer pick the same amount of oranges? How many did he pick in total on both of those days?

4) What is the difference between the number of oranges picked on Day 3 and Day 4?

5) How many oranges in total did he pick for this season?

Let’s Pause

Carroll diagrams are rectangular tables that show data in a positive or negative way. They are named after the celebrated Lewis Carroll, pen name of the author of Alice in Wonderland. He was a mathematician whose interest lay in symbolic logic.
Let's talk Math
Ask pupils what the purpose of using charts and diagrams is. Ask them to think about whether they have ever used them before. Remind them that even if they haven't seen all of them, they surely must have seen a picture graph. Discuss whether these diagrams make it easier to work with data or add another step. As they discuss this, point out that it is fair, with small numbers that are easy to handle, to say that using a chart is an unnecessary step, but that wouldn't be true if the numbers were larger and harder to keep track of. What kind of things in real-life would be easier with a figure to represent the data? And do any of the pupils have things in their lives that they think could be organised with a chart? At the end of the discussion allow the class five minutes to write a reflective paragraph.

Let's get practical
Ask pupils to collect data as homework for a Carroll diagram. It must be real, and it must be drawn from personal experience. Give them a few examples to get them thinking. They could categorise their clothes, or relatives, into any two categories. Ask them to bring their data to class, and each construct a Carroll diagram in class. Once they are done, ask them to show their diagrams to the rest of the class to make sure that it can be interpreted easily.

Activity 4
10 minutes

<table>
<thead>
<tr>
<th>Favourite games</th>
<th>Numbers of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Football</td>
<td>9</td>
</tr>
<tr>
<td>Tennis</td>
<td>3</td>
</tr>
<tr>
<td>Volley ball</td>
<td>5</td>
</tr>
<tr>
<td>Cricket</td>
<td>8</td>
</tr>
</tbody>
</table>

Prepare a data sheet for the pupils, like so:

Ask them, as a class to construct a picture graph on the board. Ask them to compare these to tally charts and Carroll diagrams, and discuss how different ways of representing data are chosen based on the data they have to represent.
Multiple Choice Questions

Read out the questions or write them on the board. You may ask pupils to either write the correct answer on a white board and hold it up or call out the options one by one, asking them to raise their hands to show which one they have chosen.

1) Which of the following would be suitable to show with a picture graph?
   a) The number of people in a school
   b) The number of boys and girls in a class
   c) The number of siblings each pupil has
   d) None of the above

2) A Carroll diagram is?
   a) A diagram that has divides objects into two groups
   b) A diagram that divides objects into four groups
   c) A diagram that lists the number of things

3) To show a large number the best options would be a?
   a) Tally chart
   b) Picture graph
   c) Carroll diagram
Lesson plans to be used in conjunction with the New Countdown book series.
### Syllabus Matching Grid of New Countdown Book 3 with the Single National Curriculum 2020

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<th>Unit</th>
<th>Contents and Scope</th>
<th>SLOs</th>
<th>Page number</th>
<th>Math Lab pages</th>
</tr>
</thead>
<tbody>
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<td></td>
</tr>
<tr>
<td>1.1. Roman numbers</td>
<td>i. Read Roman numbers up to 20</td>
<td>10 - 11</td>
<td>2</td>
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</tr>
<tr>
<td></td>
<td>ii. Write Roman numbers up to 20</td>
<td>10 - 11</td>
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</tr>
<tr>
<td>1.2. Even and odd numbers</td>
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<td></td>
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<td>1.3. Place values</td>
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<tr>
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<td></td>
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<tr>
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<td>9, 10</td>
<td></td>
</tr>
<tr>
<td></td>
<td>ii. Identify the value of a number from number line up to 2-digit numbers.</td>
<td></td>
<td>9, 10</td>
<td></td>
</tr>
<tr>
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<td>Unit</td>
<td>Contents and Scope</td>
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<td><strong>2.1. Addition</strong></td>
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<td><strong>2.2. Subtraction</strong></td>
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<td>i. Subtract numbers up to 4-digits with and without borrowing</td>
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<td>iii. Solve real life number stories up to 4-digits with and without borrowing involving subtraction</td>
<td>45 - 46</td>
<td>16</td>
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<td><strong>2.3. Multiplication</strong></td>
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<td></td>
<td></td>
<td>i. Develop multiplication tables for 6, 7, 8, and 9</td>
<td>49 - 55</td>
<td>17 - 20</td>
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<td></td>
<td></td>
<td>ii. Multiply 2-digit number by 1-digit number</td>
<td>56</td>
<td>17 - 20</td>
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<td></td>
<td></td>
<td>iii. Multiply a number by 0 and 1</td>
<td>57</td>
<td>21</td>
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<td></td>
<td></td>
<td>iv. Apply mental mathematical strategies to multiply 1-digit numbers by 1-digit numbers</td>
<td>58</td>
<td></td>
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<td></td>
<td></td>
<td>v. Solve real life situations involving multiplication of 2-digit numbers by 1-digit numbers</td>
<td>59</td>
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<td><strong>2.4. Division</strong></td>
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<td></td>
<td></td>
<td>i. Divide 2-digit number by a 1-digit number (with zero remainder)</td>
<td>61</td>
<td>22 - 25</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii. Apply mental mathematical strategies to divide 1-digit number by a 1-digit number</td>
<td>66</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>iii. Solve real life situations involving division of 2-digit number by a 1-digit number</td>
<td>63 - 65</td>
<td></td>
</tr>
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<td>Unit</td>
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<td>i.</td>
<td>69</td>
<td>26</td>
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<td>ii.</td>
<td>81</td>
<td>27</td>
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<tr>
<td>3.1. Common fractions</td>
<td>i.</td>
<td>Express the fractions in figures and vice versa</td>
<td></td>
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<td></td>
<td></td>
<td>ii.</td>
<td>Match the fractions with related figures</td>
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<tr>
<td>3.2. Proper and improper fractions</td>
<td>i.</td>
<td>Recognize proper and improper fractions</td>
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<td></td>
<td></td>
<td>ii.</td>
<td>Differentiate between proper and improper fractions</td>
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<tr>
<td>3.3. Equivalent fractions</td>
<td>i.</td>
<td>Identify equivalent fractions from the given figures</td>
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<td></td>
<td></td>
<td>ii.</td>
<td>Write three equivalent fractions for a given fraction</td>
<td></td>
</tr>
<tr>
<td>3.4. Comparing fractions</td>
<td>i.</td>
<td>Compare fractions with same denominators using symbols “&lt;”, “&gt;”, or “=”</td>
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</tr>
<tr>
<td>3.5. Addition of fractions</td>
<td>i.</td>
<td>Add two fractions with same denominators</td>
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<td></td>
<td></td>
<td>ii.</td>
<td>Represent addition of fractions through figures</td>
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<tr>
<td>3.6. Subtraction of fractions</td>
<td>i.</td>
<td>Subtract fractions with same denominators</td>
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<td></td>
<td></td>
<td>ii.</td>
<td>Represent subtraction of fractions through figures</td>
<td></td>
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<td></td>
<td></td>
<td>i.</td>
<td>Use standard metric units of length (kilometer, meter, and centimeter) including abbreviations</td>
<td></td>
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<tr>
<td></td>
<td>4.1. Length</td>
<td>ii.</td>
<td>Add measures of length in same units without carrying</td>
<td></td>
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<td></td>
<td></td>
<td>iii.</td>
<td>Solve real life situations involving same units of length for addition without carrying</td>
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<td>iv.</td>
<td>Subtract measures of length in same units without borrowing</td>
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<td></td>
<td>v.</td>
<td>Solve real life situations involving same units of length for subtraction without borrowing</td>
<td></td>
</tr>
<tr>
<td>Unit</td>
<td>Contents and Scope</td>
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</tr>
<tr>
<td>4.2.</td>
<td>Mass</td>
<td>i. Use standard metric units of mass (kilogram and gram) including abbreviations</td>
<td>95</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td></td>
<td>ii. Add measures of mass in same units without carrying</td>
<td>97</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td></td>
<td>iii. Solve real life situations involving same units of mass for addition without carrying</td>
<td>99</td>
<td>44</td>
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<td></td>
<td></td>
<td>iv. Subtract measures of mass in same units without borrowing</td>
<td>99</td>
<td>44</td>
</tr>
<tr>
<td></td>
<td></td>
<td>v. Solve real life situations involving same units of mass for subtraction without borrowing</td>
<td>99</td>
<td>43</td>
</tr>
<tr>
<td>4.3.</td>
<td>Capacity</td>
<td>i. Use standard metric units of Capacity (liter and milliliter) including abbreviations</td>
<td>100</td>
<td>100</td>
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<tr>
<td></td>
<td></td>
<td>ii. Add measures of capacity in same units without carrying</td>
<td>101</td>
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<td>iii. Solve real life situations involving same units of capacity for addition without carrying</td>
<td>101</td>
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<td>iv. Subtract measures of capacity in same units without borrowing</td>
<td>101 - 102</td>
<td>101 - 102</td>
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<td></td>
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<td>v. Solve real life situations involving same units of capacity for subtraction without borrowing</td>
<td>102</td>
<td>102</td>
</tr>
<tr>
<td>Unit 5:</td>
<td>5.1. Time</td>
<td>i. Use a.m. and p.m. to record the time from 12-hour clock</td>
<td>104</td>
<td>104</td>
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<tr>
<td></td>
<td></td>
<td>ii. Read and write time from analog and digital clocks</td>
<td>106 - 107</td>
<td>106 - 107</td>
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<tr>
<td></td>
<td></td>
<td>iii. Read and write days and dates from the calendar</td>
<td>111 - 112</td>
<td>111 - 112</td>
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<tr>
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<td>iv. Add measures of time in hours</td>
<td>109</td>
<td>109</td>
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<td></td>
<td></td>
<td>v. Solve real life situations involving measures of time for addition of hours</td>
<td>109</td>
<td>109</td>
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<td></td>
<td></td>
<td>vi. Subtract measures of time in hours</td>
<td>109</td>
<td>109</td>
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<td></td>
<td></td>
<td>vii. Solve real life situations involving subtraction of measures of time in hours</td>
<td>110</td>
<td>110</td>
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<td>Unit</td>
<td>Contents and Scope</td>
<td>SLOs</td>
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<td>Math Lab pages</td>
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<td>i.</td>
<td>117</td>
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<td>ii.</td>
<td>116</td>
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<td>iii.</td>
<td>120</td>
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<td>iv.</td>
<td>129</td>
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<td>v.</td>
<td>122</td>
<td>122</td>
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<td></td>
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<td>i.</td>
<td>125</td>
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<td>ii.</td>
<td>125 - 126</td>
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<td>i.</td>
<td>127 - 128</td>
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<td>ii.</td>
<td>128</td>
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<td>i.</td>
<td>134 - 135</td>
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<td>ii.</td>
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<td>iii.</td>
<td>135</td>
<td>135</td>
</tr>
</tbody>
</table>
Whole Numbers

Suggested Time Frame
10-12 periods

Learning Curve

Students have already learnt to identify the place value of numbers up to 3 digits. In the light of their previous knowledge they will read and write numbers up to 6 digits. In Grade 3 they have learnt to write 3-digit numbers in expanded form, they have also ordered and compared 2-digit and 3-digit numbers. Now, they will learn to read and write numbers up to 6 digits in numerals and words. They will also be able to compare two numbers using symbols, write numbers in ascending and descending order, represent and identify a given value of number on a number line.

They may have seen the Roman numbers on clocks and watches. They learn about the letters of the alphabet, which represent different Roman numbers and the order in which they are placed.

Real-life Application

Numbers are seen everywhere in our daily-life. We find numbers on price tags, phonebooks, and house addresses. Numbers are also found as page numbers in a book, age of people, in buying and selling, measuring length, weight, and capacity, and many more.

Frequently Made Mistakes

• Students generally get confused between the symbols of greater than and lesser than, while comparing numbers.
• Sometimes the terms successor and predecessor are not clearly understood.

Summary of Key Facts

• Even numbers are exactly divided by 2. They end with 0, 2, 4, 6 or 8.
• Odd numbers are not exactly divided by 2.
• The numbers 0, 1, 2, 3, 4, 5, 6, 7, 8, and 9 are called Arabic numerals.
• Romans used 7 letters of the alphabet to represent numbers i.e. I, V, X, L, C, D, M.
• For comparison of numbers, first check the place values of thousands, secondly, the hundreds, then check the tens and lastly, the ones.
• When numbers are arranged from smallest to the greatest, they are said to be in ascending order.
• When numbers are arranged from greatest to the smallest, they are said to be in descending order.
• The number that comes just before a number is called the predecessor of that number (‘pre’ means before.)
• The number that comes just after a number is called the successor of that number (‘succeed’ means follow.)

**Model Lesson Plan**

**Topic**
Roman Numbers 1-20

**Duration**
80 minutes

**Specific Learning Objective**
To introduce Roman numbers to children

**Key Vocabulary**
Roman number, alphabet, Arabic numbers

**Resources**
A board display with the Roman symbols and their corresponding Arabic numbers, clocks or watches with time written in Roman numbers.

<table>
<thead>
<tr>
<th></th>
<th>I</th>
<th>V</th>
<th>X</th>
<th>L</th>
<th>C</th>
<th>D</th>
<th>M</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>5</td>
<td>10</td>
<td>50</td>
<td>100</td>
<td>500</td>
<td>1000</td>
</tr>
</tbody>
</table>

**Starter: Engagement Activity (5 mins)**
The students may have seen Roman numbers on clocks and watches. Show the students the clocks and watches which have time written in Roman numbers. Ask which letters they can see on the clocks and watches. Are they the same on each clock?

**Main Developmental Activity (20 mins)**
• Introduce Roman numbers to the children, using the board display, based on the diagram on page 3 in Countdown 3.
• Moving from the known to the unknown, tell them that today’s number system uses the Arabic numerals.
• Ask the students to find similar numbers in other places, inside or outside the classroom. A smart child may spot it on the watch brought to the class by the teacher, or sometimes in books showing unit numbers.
• Teach them some ways of remembering the Roman number symbols.
• Tell them the Roman numbers 1-10 written in their symbols is as following:

<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
</tr>
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<tr>
<td>I</td>
<td>II</td>
<td>III</td>
<td>IV</td>
<td>V</td>
<td>VI</td>
<td>VII</td>
<td>VIII</td>
<td>IX</td>
<td>X</td>
</tr>
</tbody>
</table>

Tell them the rules of forming numbers.

When a symbol appears after a larger (or equal) symbol it is added.

Example: VI = V + I = 5 + 1 = 6  
Example: XX = X + X = 10 + 10 = 20

But if the symbol appears before a larger symbol it is subtracted.

Example: IV = V − I = 5 − 1 = 4  
Example: IX = X − I = 10 − 1 = 9

Don’t use the same symbol more than three times in a number.

Children need to be able to do further mental addition, in order to work with Roman numbers.

VIII = 8, and X = 10  
XVIII = 18 and MM = 2000
Numbers Operations

Suggested Time Frame
12-14 periods

Learning Curve
The students are able to add and subtract numbers up to 999. With the help of practical work as well as written sums in these pages, the students will add and subtract numbers with results up to 9999. They learn how to group ones into 10s, tens into hundreds, and hundreds into thousands (carry over sums). The children first subtract 4-digit numbers without borrowing. Next, they convert 1000s to 100s, 100s to 10s, and 10s to ones by ‘borrowing’ from the thousands, hundreds, and tens columns respectively. The methods are identical, and this transition does not take long.

The children are able to skip-count using the number line. They know their tables to 10, and are able to multiply 3-digit numbers by a 1-digit number. (They already know conversions). Here, they move a step forward and multiply 3-digit numbers by 2-digit numbers with ease.

Children are familiar with multiplication. Division can only be understood if there is a sound knowledge of multiplication and children have had adequate practical exercise in this area.

Children are also familiar with long division. Now, they learn to divide 3-digit numbers, and are introduced to the concept ‘remainder’, first in practical situations and then in division sums.

Real-life Application
- Numbers are an essential part of our life. Numbers are used in everything we do. We add and subtract all the time without realising it.
- Going shopping involves all the four operations. To work out what we need to pay, we have to add the costs of our purchasing. We need to subtract to know how much we are going to get back if we present a bigger note than the shopping amount. A new car or furniture, or a new sibling in the family is as
addition. For lending some toys to a friend and calculating how many toys will be left, or spending some money and finding out how much money we still have, involves subtraction. Problems about real things that children can see and touch give them real experience of addition and subtraction. Similarly, knowing the cost of one and finding the cost of more will bring experience of multiplication. Similarly dividing and sharing things will give them the idea of division.

**Frequently Made Mistakes**

- Students make mistakes in carrying and borrowing numbers.
- They make mistakes in times tables.
- They fail to bring down the correct number while performing division.

**Summary of Key Facts**

- For addition and subtraction of 4-digit numbers, place the numbers correctly under each place value.
- Multiplication is repeated addition.
- Division is equal sharing or equal grouping of numbers.
- The number to be divided is called the ‘dividend’.
- The number which divides is called the ‘divisor’.
- The result of dividing a number is called the ‘quotient’.
- If the number is not fully divided, the remaining number is called the ‘remainder’.
- The number which is being multiplied is termed the ‘multiplicand.’
- The number which multiplies is termed the ‘multiplier.’

**Model Lesson Plan**

**Topic**
Number Operations

**Duration**
80 minutes

**Specific Learning Objectives**
By the end of the lesson students will be able to add and subtract 4-digit numbers.

**Key Vocabulary**
Addition, subtraction, altogether, totals, and left

**Resources**
Worksheet, chart papers, and markers, fish cut-outs with attached metal clips, and a fishing rod attached with a magnet at one end.
Strategy

Starter: Engagement Activity (5 mins)
Give them story sums of addition and subtraction as follows:

- Grade 10 students raised Rs 4624 and Grade 9 collected Rs 1118 at the Bake Sale. How much money did they collect altogether?
- Hina takes 5544 bangles to sell at a fair. In one day she sells 666. How many does she have left for the next day?
- Ask them to solve the sums on their whiteboards and hold them up.

Main Developmental Activity

Pair work (30 mins)

- Group the students pairs.
- Place 2 baskets on the table, each basket contains fish cut-outs with three or four digit numbers written on it, such as 20145, 1000, 997 and so on.
- Ask the students of each group to come in pairs and catch one fish from each box.
- Ask each pair to make an addition and a subtraction sum from the numbers written on the fish. One of them will add and the other will subtract showing their answers on whiteboards.

\[
\begin{align*}
2 & \quad 9 & \quad 8 & \quad 5 & \quad + & \quad 5 & \quad 0 & \quad 7 & \quad 4 \\
5 & \quad 0 & \quad 7 & \quad 4 & \quad & \quad - & \quad 2 & \quad 9 & \quad 8 & \quad 5 \\
\hline
\end{align*}
\]

- The pair which finishes early can have another chance to collect the fish.
- Acknowledge the pair which delivers the maximum number of correct answers.
Suggested Time Frame
8–10 periods

Learning Curve
Students already know that a fraction is a part of a whole. They are familiar with \( \frac{1}{2} \) s and \( \frac{1}{4} \) s, as used in everyday life. They are gradually introduced to other fractions, starting with the simplest: \( \frac{1}{2} \), \( \frac{1}{3} \), \( \frac{1}{4} \), and, \( \frac{1}{5} \) ...

With practical work, addition and subtraction of like fractions are also introduced.

Real-life Application
Fractions are used in:
- baking—it tells how much of an ingredient to use.
- telling time; each minute is a fraction of the hour.
- doctor’s prescription to tell how much of a medicine, especially the quantity of syrup to be taken.
- games like soccer, football, and basketball, as they are split into halves and quarters.

Summary of Key Facts
- A fraction is a number that represents a part of a whole.
- The lower number indicates the number of equal parts a shape (or a collection) has been divided into. It is called the denominator.
- The top number indicates the number of those equal parts used or referred to. It is called the numerator.
- When the numerator and denominator are multiplied by the same number (except 0), we get an equivalent fraction.
• Fractions with the same denominator are called like fractions.
• In unlike fractions with the same numerator, the smaller the denominator, the greater is the value of the fraction.
• To add like fractions, add only the numerators. The denominator remains the same.
• To subtract a fraction from another like fraction, subtract the smaller numerator from the larger one. The denominator remains the same.

### Model Lesson Plan

**Topic**
Fractions

**Duration**
80 minutes

**Specific Learning Objectives**
By the end of the lesson students will be able to revise the concept of 1/2 and ¼, moving to other fractions such as 1/8 and 1/10.

**Resources:**
Strip of papers, differently coloured circles.

**Key vocabulary**
Numerator, denominator, equal, halves, quarters, like fractions, and unlike fractions.

**Strategy**

**Starter: Engagement Activity (5 mins)**
Begin with a recapitulation of fractions, using a story and build up more stories on the rest of the fractions.

For example, Mamma Bear spread some chocolate sauce over a crusty pie cut in quarters. She put it on one quarter for Baby Bear, one for Papa Bear and one for her own share. How many quarters did she put the sauce on? How many quarters did not have any chocolate sauce? The answer is three quarters or $\frac{3}{4}$; and one-quarter or $\frac{1}{4}$.

**Main Developmental Activity (20 mins)**

• Introduce students to other fractions with the use of strips of paper or coloured circles.
• Use one shape at a time, but the same fraction must be demonstrated with different shapes, so that children see a fraction associated with any shape or any set of objects.
• Associate the fractions and fraction names.
  2 equal parts: 2 halves in a whole
  3 equal parts: 3 thirds in a whole
  4 equal parts: 4 quarters in a whole
  10 equal parts: 10 tenths in a whole
  100 equal parts: 100 hundredths in a whole

• Demonstrated the same, using pictures and finally the children move on to calculating with numbers alone.
Measurement: Length, Mass, and Capacity

Suggested Time Frame
16 periods

Learning Curve
Children are able to convert:
- metres to centimetres and kilometres to metres
- kilograms to grams
- litres to millilitres.

They are able to solve word problems involving addition and subtraction with length, weight and capacity. (Children are already familiar with the use of the four operations, working with 4-digit numbers.)

Now they will learn to add and subtract the units of measurement with carrying the smaller unit to the bigger unit, and borrowing by the bigger unit.

Real-life Application
- Units of length are used to measure the distance, to find height, length, and breadth.
- Units of weight are used at grocery shops, doctor’s clinic, hospitals, and markets.
- Units of capacity are used to measure liquids like water, juices, milk, and smoothies etc.

Frequently Made Mistakes
- Students get confused in conversion factors.
- They make mistakes when converting smaller unit to bigger unit.

Summary of Key Facts
- We can use a short form for the standard units of measurements.

<table>
<thead>
<tr>
<th>Unit</th>
<th>Abbreviation</th>
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<tbody>
<tr>
<td>kilometre</td>
<td>km</td>
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<td>metre</td>
<td>m</td>
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<tr>
<td>centimetre</td>
<td>cm</td>
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<td>kilogram</td>
<td>kg</td>
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<tr>
<td>gram</td>
<td>g</td>
</tr>
<tr>
<td>litre</td>
<td>l</td>
</tr>
<tr>
<td>millilitre</td>
<td>ml</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 km = 1000 m</td>
</tr>
<tr>
<td>1 m = 100 cm</td>
</tr>
<tr>
<td>1 kg = 1000 g</td>
</tr>
<tr>
<td>1 l = 1000 ml</td>
</tr>
</tbody>
</table>
Suggested Activities

Group Activity (20 mins)
Learning Outcome: Write standard units of length in abbreviations.

Resources: Cards with different length, weight, and capacity with units in full form for example, 5 kilometres, and a tic tac toe board made on a sheet of chart paper

Instructions:
- Students are divided into two groups, named ‘Os’ and ‘Xs’.
- They are each given a bunch of measurement cards.
- To place their mark on the tic tac toe board, players have to pick one measurement card, read it, and then record the unit of measurement in the abbreviation on the tic tac toe board.
- Continue until someone wins or all spaces are filled.
- You can make several groups of ‘Os’ and ‘Xs’ and have this competition between them.

Individual Activity (15 mins)
Learning Outcome: Read standard units of volume.

Resources: Activity sheets

Instructions:

<table>
<thead>
<tr>
<th>Use the clues to work out who has which container.</th>
</tr>
</thead>
<tbody>
<tr>
<td>![Image of containers A, B, C]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ayesha</th>
<th>Ahmed</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;I have exactly half a litre.&quot;</td>
<td>&quot;I have 1000 ml.</td>
</tr>
<tr>
<td>Answer: Container____</td>
<td>Answer: Container____</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Areeba</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;I have more than 300 ml but less than 400 ml.&quot;</td>
</tr>
<tr>
<td>Answer: Container____</td>
</tr>
</tbody>
</table>
Individual Activity (20 mins)
Learning Outcome: Solve real-life problems involving the same units of length, mass and volume.
Resources: Worksheet
Instructions:
• Prepare the given worksheet for the whole class.
• Revise units of length, weight, and capacity orally.
• Discuss the addition and subtraction of units of measurement.
• Distribute the worksheet and provide help where needed.

To make Fruit Punch for 2 people, we need:
   o 300 ml of pineapple juice
   o 250 ml of orange juice
   o 500 ml of lemonade
• How much liquid is used in total to make Summer Punch for 2 people?
• How much orange juice would be needed to make enough for 4 people?

Dania buys two apples and three bananas. One apple weighs 75 g. Three bananas weigh the same as two apples. How much does one banana weigh?

Model Lesson Plan

Topic
Measurements

Suggested Duration
2 Periods

Specific Learning Objectives
By the end of the lesson students will be able to add and subtract with accuracy, using units of length (m, cm), weight (kg, and g).

Key Vocabulary
Length, weight, metre, centimetre, kilogram, and gram

Resources:
Pieces of ribbons, small buckets, various containers of different shapes

Strategy
Starter: Engagement Activity (5 min)
Reinforce the bigger and smaller units of length, weight, and capacity with abbreviations.
Main Developmental Activity (20 mins)

- Divide the students in pairs.
- Set up the classroom in such a way that it provides a large number of things for measurement and measuring equipment too.
- Ask one child to guess the length of a piece of a ribbon and the rim of a bucket, and the other to write it down. Then, ask them to take actual measurements and decide whether the guesses were correct or not.
- Similarly, ask the students to try and guess the capacity of containers of different shapes and sizes. Will a tall vase hold more water than a flat plate? By how much?
- Ask them to hold a papaya in one hand and a banana in the other hand. Ask them to say which is heavier? Can they guess by how much?
- Now move to addition.
  - Write the following word problem on the board and ask them to solve it.
    ‘A lorry is carrying 4 cars, one on top of the other. The floor of the lorry is at a height 1 m 10 cm from the road surface. The three cars (without wheels) are 1 m 30 cm high. Will the lorry be able to go under a flyover, which is 8 m from the ground?’
  - Record the addition, with m and cm in separate columns.
  - Then move to subtraction. Write the following word problem on the board.
    ‘Cut a 4 m 2 cm piece of ribbon from a 7 m 20 cm long one. How much is left?’
  - Find the difference between the heights of two students in the class.
  - Ask them to solve these problems in their school notebook.
  - Check the work of each student thoroughly and provide guidance where needed.
**Suggested Time Frame**
8-10 periods

**Learning Curve**
Students are familiar with the clock-face and know how to read time half past the hour, quarter past the hour and on the hour. They have a fair idea about simple fractions, and are able to skip-count in fives.

Students are able to read time in hours, and, with some help, in minutes. With a little practice, they will be able to use a.m. and p.m. and read the clock face accurately.

**Real-life Application**
Time is an important factor in our lives. We find time in all walks of our lives.

- Time management is important for students to do the study with focus and getting good grades.
- We mention time in occasions, events, functions, meetings, gathering, parties, and congregations.
- To be punctual is vital for a successful life.

**Summary of Key Facts**
- There are two types of clocks i.e. digital and analogue. Analogue clocks may have Roman numbers I to XII also. A digital clock has digits to tell the time.
- There are two types of calendars (solar and lunar). Solar calendar is based on the movement of the Sun. Lunar calendar is based on the movement of the Moon.
- January, March, May, July, August, October, and December have 31 days.
- February either has 28 days and 29 days in leap year.
- A leap year has 366 days and comes after every 4 years.
- 24 hours=1 day
- 7 days=1 week
• 14 days = 1 fortnight
• 30 days = 1 month
• 12 months = 1 year
• 10 years = 1 decade
• 100 years = 1 century
• 1000 years = 1 millennium

Model Lesson Plan

Topic
Time

Duration
80 minutes

Specific Learning Objectives
Children learn to measure time by minutes and hours with the intervals of fives, and learn the use of a.m. and p.m.

Key Vocabulary
Clock, hour, minute, past, p.m. (post meridiem), a.m. (ante meridiem)

Resource
Clock with the long, minute hand and the short, hour hand.

Strategy
Starter: Engagement Activity (10 mins)
Recapitulate the concepts of ‘half past’, ‘quarter past’ and ‘quarter to’ the hour. It will be helpful and serves as a base to start newer concepts.

Main Developmental Activity (30 mins)
• Point out the 60 small divisions on the clock.
• Tell them each division represents a minute.
• Now make them understand when the minute hand goes all around the clock face, 60 minutes have passed or an hour has passed. The minute hand goes once around the clock face in one hour.
• Show them the movement of the hour hand. It moves only 5 spaces on the clock face from 1 to 2, or 2 to 3, or 3 to 4 and so on.
• Now explain that the numbers around the clock-face act like numbers on a number line: they are always skip-counting in 5s as it takes 5 minutes to move from one number to the other.
• Show them, if the minute hand is on 8, it means ‘40 minutes past the hour’ revise 8 times 5s is 40.
• Now move the minutes hand on to different numbers, asking the students the minutes past.
  Children are aware that a day has 24 hours.
• Explain that the time from 12 midnight to 12 noon is called a.m. which means ‘in the morning’ (in Latin, ante meridiem means ‘before noon’) and between 12 noon and 12 midnight is called p.m. (in Latin, post meridiem means after noon)

Give them a list of exercises, where children use a.m. or p.m.

Bath time: 7 (some might say ‘a.m.’ some might say ‘p.m.’)
Bed time: 8 p.m. (cannot be 8 a.m.)
Lunch time: 12 noon
Play time: 4 p.m. (at 4 a.m. children should be asleep.)
Geometry

Suggested Time Frame
8-10 periods

Learning Curve
Students recognise 3-D objects and their names. They are aware of the number of faces, edges and vertices each shape has. At this level they are introduced to terms such as parallel lines, points, line segments, and the calculation of the perimeter of shapes.

Real-life Application
The global positioning system of satellites uses geometrical principles to calculate the position of the satellites. Geometry helps in the field of medicine e.g. X-ray and ultrasound. Geometry also helps in the accurate calculation of physical distances. It helps in the field of astronomy to map the distance between planets and stars. Geometry is used in computer aided designs, it entails lines, curves, and angles. Geometry plays an important role in designing buildings, walls, and doors.

Frequently Made Mistakes
• The students make mistakes in identifying the different types of lines.
• They confuse the names of different shapes.

Summary of Key Facts
• A line is a set of points joining a straight path on both sides.
• A line segment is a line which joins 2 points together.
• A ray is similar to a line segment but one end point extends infinitely in one direction.
• Parallel lines are two lines which never meet. The distance between the two lines remains the same.
• Shapes with 3 sides are called triangles. They have 3 sides and 3 corners.
Shapes with 4 sides and 4 corners are called quadrilaterals.
There are different types of quadrilaterals: Square, rectangle, rhombus, parallelogram, and kite.
Polygons are those figures which have many sides.
A circle is a flat round closed shape with no corners or edges. The curved line is the boundary of the circle.
The length of the boundary of a circle is called its circumference.
A centre is a fixed point inside a circle which is equidistant from all the points on the circumference.
A radius is a line joining the centre point and any point on the circumference of the circle.
The diameter is a line passing through the centre and joining two different points on the circumference.

Model Lesson Plan

Topic
Quadrilaterals

Suggested Duration
80 minutes

Specific Learning Objectives
By the end of lesson students will be able to name 4-sided shapes and their properties.

Key Vocabulary
Quadrilateral, parallel lines, rhombus, parallelogram, and vertices

Resources
Classroom objects, pictures of objects with parallel lines, and strips of paper.

Strategy

Starter: Engagement Activity (5 mins)
After a revision of 3-D shapes, discuss some examples of parallel lines from everyday life such as railway tracks, roller coaster tracks, and the two sides of a road or edges of a board, a TV screen, a desk or a door frame. Ask the students to observe that the railway lines are parallel because they never meet.

Main Developmental Activity

• Tell them that certain shapes too have parallel sides, such as squares, rectangles and diamonds. A triangle cannot have parallel sides.
• Assign the students to identify shapes and objects in the classroom which have parallel lines.
• Give them strips of paper to construct 4-sided shapes (quadrilaterals: quadri means ‘four’) with parallel sides.
• Introduce the names of some quadrilaterals such as rhombus, parallelogram, and kite as they already know about square, and rectangle.
• Draw the above mentioned shapes on the board and teach them about the corners and the sides of each.
• Introduce the word ‘polygon’ defined as shapes with at least three sides or more.
• They know that a 4 sided figure is a quadrilateral. Tell them about the pentagon (5 sided), hexagon(6 sided), and octagon (7 sided).
Suggested Time Frame

4-6 periods

Learning Curve

This unit provides an introduction to data handling. The three steps of data handling are collection, organisation and interpretation of data. In this unit they are going to learn that a picture graph, or pictograph, is used to display information that uses images or symbols to represent data. Moreover, the students will also learn about the column graph in which the information from data is illustrated with horizontal columns.

Real-life Application

- Pictograph uses pictures and symbols to represent information or quantities.
- A column graph is used to show data comparison. For example, comparison of rainfall in different cities of a country or comparison of yields of a crop in the last two years.

Frequently Made Mistakes

- Students make mistakes in counting the objects.
- Sometimes they are not able to decide which quantity should be taken on vertical line and which quantity should be taken on horizontal line.

Summary of Key Facts

- A pictograph, or a picture graph, is a pictorial representation of data.
- Column graphs also represent data.
Lesson Plan

Model Lesson Plan

Topic
Graph

Suggested Duration
80 minutes

Specific Learning Objectives
By the end of the lesson students will be able to represent the information in a bar graph.

Key Vocabulary
Data, bar graphs

Resources
Chart paper, markers

Strategy
Starter: Engagement Activity (5 mins)
Ask the students to hold different colour pencils and make data of the number of pencils of each colour.

Main Developmental Activity (25 mins)
Instructions:
• Talk to your students about the importance of having breakfast in the morning. Discuss healthy options for breakfast.
• Give one paper plate to each student.
• Ask students to write down what they had for breakfast that morning, and to draw a picture of it.
• Ask the students who did not have breakfast to write ‘nothing’.
• Group the breakfast items into categories such as ‘milk and cereal’, ‘fruits’, ‘toast’, ‘eggs’, etc.
• Explain that a bar graph will make it easy to organise the students’ responses.
• Divide the students into 4 groups.
• Each group will sort out and organise the data by gathering all plates which represent the same category of breakfast, for example milk and cereals by one group.
• Spread the chart paper on the board.
• Call out each group one by one. They will tell the data of the particular category which they had on their table.
• Draw a bar for the particular breakfast category on the chart paper.
• Repeat the same steps for each of the remaining categories. Analyse the bar graph and discuss the data.
• Write 5 questions on the board such as:
  1) How many students had cereal in the morning?
  2) Which food was liked by most of the students?
  3) How many students did not have breakfast?
• Encourage students to find the answers from the graph, write them on whiteboards, and share with their partners.
A

**a.m.**
we use a.m. to tell the time from 12 midnight to just before 12 noon

B

**bar graph**
the arrangement of data that represents a collection of things as rectangular bars

C

**capacity**
the greatest amount of three-dimensional space an object can hold

**centimetre (cm)**
a smaller unit of measure of length (see metre)

**columns**
the vertical lines in a grid

D

**denominator**
the number below the line in a fraction, showing the number of equal parts the whole is divided into

Example

\[
\frac{3}{4} \quad \text{denominator}
\]

**difference**
the result when we subtract or take away numbers

E

**equivalent fractions**
fractions with different numerators and denominators but are equal in size

Example

\[
\frac{1}{3}, \frac{2}{6}, \frac{3}{9} \text{ and } \frac{4}{12}
\] are equivalent fractions.

F

**fraction**
a part of a whole cut into equal parts

Example

\[
\frac{1}{3}
\]
**G**

gram (g)
a smaller unit of mass (see kilogram)

**H**

horizontal line
a line which runs from left to right

*Example*

A _______ B

Line AB is a horizontal line.

hundreds digit
the digit before the tens digit in a number

*Example*

In 439, ‘4’ is the hundreds digit and it represents 4 hundreds or 400.

**K**

kilogram (kg)
a unit of measure of mass, where 1 kg = 1000 g

kilometre
a unit of measure of length, where 1 km = 1000 m

**L**

length
the measure of an object from one end to the other

**M**

litre (ℓ)
a unit of measure of volume, where 1 ℓ = 1000 ml

mass
the amount of matter in an object

metre (m)
a unit of measure of length, where 1 m = 100 cm

millilitre (ml)
a smaller unit of measure of volume (see litre)

multiplication table
shows the results of the same number multiplying a set of other numbers, usually in an increasing order numbers

*Example*

<table>
<thead>
<tr>
<th>1 × 9</th>
<th>9</th>
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<tbody>
<tr>
<td>2 × 9</td>
<td>18</td>
</tr>
<tr>
<td>3 × 9</td>
<td>27</td>
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<tr>
<td>4 × 9</td>
<td>36</td>
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<tr>
<td>5 × 9</td>
<td>45</td>
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<tr>
<td>6 × 9</td>
<td>54</td>
</tr>
<tr>
<td>7 × 9</td>
<td>63</td>
</tr>
<tr>
<td>8 × 9</td>
<td>72</td>
</tr>
<tr>
<td>9 × 9</td>
<td>81</td>
</tr>
<tr>
<td>10 × 9</td>
<td>90</td>
</tr>
</tbody>
</table>
**N**

number line
the arrangement of numbers on a straight line where the numbers to the right are greater than the numbers to the left

Example

```
0 1 2 3 4 5 6 7 8 9 10
```

**P**

p.m.
we use p.m. to tell the time from 12 noon to just before 12 midnight

perimeter
the total length around each shape

perpendicular lines
two straight lines that meet at a right angle (see right angle)

Example

```
A D B
C
```

We write CD ⊥ AB or AB ⊥ CD.

**R**

remainder
the number left over when a number cannot be divided equally

rows
the horizontal lines in a grid

**O**

ordering of numbers
the comparison of numbers as greater than or less than

**S**

sum
the result when we add numbers
thousands digit
the digit before the hundreds digit in a number

Example
In 2439, ‘2’ is the thousands digit and it represents 2 thousands or 2000.

timeline
a model used to show the amount of time taken

Example

1 hr

3.00 p.m. 4.00 p.m.

vertical line
a line which runs straight up and down

Example

X


Y

Line XY is a vertical line.

weighing scale
an instrument that measures the mass of an object

Example
Lesson plans to be used in conjunction with the Maths Wise book series.
## Syllabus Matching Grid of Maths Wise Book 3 with the Single National Curriculum 2020

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<tr>
<td>4.2. Mass</td>
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<td></td>
<td>ii. Add measures of mass in same units without carrying</td>
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<td></td>
<td>iii. Solve real life situations involving same units of mass for addition without carrying</td>
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<td>iv. Subtract measures of mass in same units without borrowing</td>
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<td>v. Solve real life situations involving same units of mass for subtraction without borrowing</td>
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<td></td>
<td>ii. Add measures of capacity in same units without carrying</td>
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<td>iii. Solve real life situations involving same units of capacity for addition without carrying</td>
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<td>vi. Subtract measures of time in hours</td>
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<td>vii. Solve real life situations involving subtraction of measures of time in hours</td>
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UNIT 1

ASSESS AND REVIEW

Teaching objectives
• to revisit concepts and skills learnt in the previous year
• to revise addition, subtraction, multiplication, and division of numbers
• to work with basic concepts of fractions
• to solve time-related problems in daily life

Learning outcomes
Students should be able to:
• recall the concepts learnt during the previous year
• recognize 2D and 3D shapes
• work out every-day problems based on the concepts of addition, subtraction, multiplication, and division
• tell the time
• work with simple fractions

UNIT 2

NUMBERS

Teaching objectives
• to recognize and write Roman numerals
• to identify odd and even numbers within a sequence
• to identify place value up to 6-digit numbers (100,000)
• to introduce number names, expanded forms, and place value up to 6 digits
• to compare and sequence numbers

Learning outcomes
The students should able to:
• identify commonly-used Roman numerals
• recognise even and odd numbers up to 99 in a given sequence
• demonstrate understanding of place value in numbers of up to 6 digits
• use the <, >, and = symbols correctly to compare 2 numbers
• order and sequence numbers
UNIT 3

NUMBER OPERATIONS

Teaching objectives
• to practice horizontal and vertical addition
• to reinforce addition with and without carrying over
• to revise subtraction with and without borrowing
• to introduce multiplication tables from 6 to 9
• to introduce multiplication of 2 digit number by a single digit number
• to introduce short and long division
• to introduce word problems involving all 4 operations

Learning outcomes
Students should be able to:
• perform horizontal and vertical addition
• add numbers with carrying over
• perform subtraction with/without borrowing
• use multiplication tables up to 10
• perform long and short division
• solve word problems involving real-life situations using all 4 number operations

UNIT 4

FRACTIONS

Teaching objectives
• to introduce common fractions and match them with related figures
• to solve equivalent fractions
• to work with proper and improper fractions
• to compare fractions
• to add fractions with a common denominator

Learning outcomes
Students should be able to:
• work with different types of fractions and relate them to everyday objects and situations
• compare different fractions
• add and subtract fractions with the same denominator
UNIT 5

MEASUREMENTS

Teaching objectives
• to introduce metric measurements and their units
• to compare, add, and subtract units of length, weight, and capacity

Learning outcomes
Students should be able to
• use units of length, weight, and capacity
• add and subtract units of length, weight, and capacity

UNIT 6

TIME

Teaching objectives
• to explain how to tell the time using a.m./p.m.
• to explain the midnight, midday, midnight sequence
• to introduce digital and analogue clocks
• to practise adding and subtracting hours
• to read and write dates from a calendar

Learning outcomes
Students should be able to:
• differentiate between a.m. and p.m. time
• calculate time before and after a given hour
• remember the calendar sequence correctly and read and write dates

UNIT 7

GEOMETRY

Teaching objectives
• to introduce the concept of lines and rays
• to demonstrate how to draw triangles and quadrilaterals
• to introduce the circle and identify its components
• to introduce the concept of symmetry
• to introduce the concept of perimeter
Learning outcomes
Students will be able to:
• differentiate between a line and a line segment
• define a point
• draw triangles and quadrilaterals using a ruler and a pencil
• recognize circles in nature and work with components of circles
• draw a circle of a given radius
• identify reflective symmetry and draw lines of symmetry
• measure perimeters

UNIT 8
GRAPHS
Teaching objectives
• to introduce Carroll diagram
• to introduce graphs
• to introduce pictograms using symbols

Learning outcomes
Students should be able to:
• Interpret a Carroll diagram
• explain the idea of graphical representation
• collect data
• devise a scale and a key
• display data in a pictogram
• interpret a pictogram

UNIT 9
ASSESS AND REVIEW 2
Teaching objectives
• to revise concepts learnt throughout the year

Learning outcomes
Students should be able to:
• demonstrate understanding of the concepts learnt through the year